WAGENINGEN WORLD

MAGAZINE OF WAGENINGEN UNIVERSITY & RESEARCH ABOUT CONTRIBUTING TO THE QUALITY OF LIFE NO. 4 2018

Sticky frog legs are inspiration for soft tweezers

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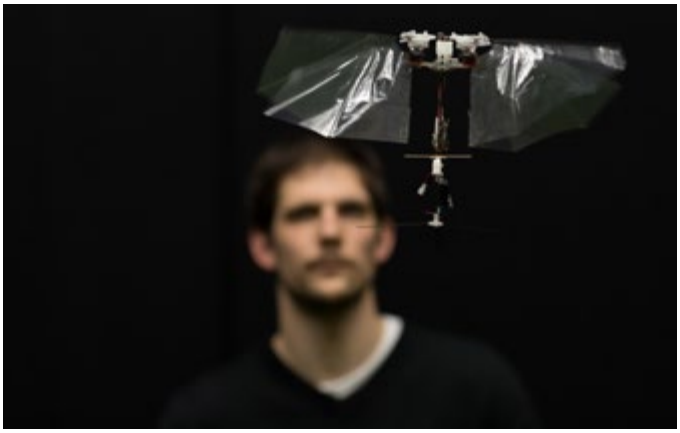
Scientists help figure out how to close cycles in agriculture

Less sugar, but still tasty
Cookie and sweet producers work on reducing sugar in their products

Apply soil science more
'Applied research is not always seen as the real thing'



WAGENINGEN UNIVERSITY & RESEARCH

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The mission of Wageningen University and Research is 'To explore the potential of nature to improve the quality of life'. Under the banner Wageningen University & Research, Wageningen University and the specialised research institutes of the Wageningen Research Foundation have joined forces in contributing to finding solutions to important questions in the domain of healthy food and living environment. With its roughly 30 branches, 5,000 employees and 10,000 students, Wageningen University & Research is one of the leading organisations in its domain. The unique Wageningen approach lies in its integrated approach to issues and the collaboration between different disciplines.

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FEATURES

PHOTO ADRIE MOUTHAAN

A new century

'When this *Wageningen World* lands on your doormat, the year 2018 will be drawing to a close and we in Wageningen will be embarking on a new century. This year we have looked back and celebrated our successes. Successes which, as we have seen, have not gone unnoticed. Both the national and the international press came to see us, and numerous tributes made us realize that we truly have achieved great things in the areas of agriculture, food production and the environment.

We did it together. Together, as a community of students, teachers and alumni, as well as together with our partners in the national and international business world and in scientific institutions, NGOs and governments. Not to forget our continuous dialogue with society, which has helped us learn from our mistakes and also rectify them. After all, food production is a complex issue and successes can sometimes have unforeseen side effects. The solution in such cases is not, of course, to stop striving for innovation, but to keep on learning. That's what we have done for the past 100 years, and that is what we will go on doing for the next 100 years.

This is our task, this is our mission. Not to look back but to face the challenges undaunted and armed with the best expertise, the best degree programmes, and the best science.

It has been clear to us this past year that we do not have to do this on our own: hundreds of national and international partners have celebrated with us, and contemplated the future of our food, our nature and our health with us. Dozens of businesses attended our Company Day, hundreds of guests pondered the Sustainable Development Goals with us, and worldwide thousands of alumni got together to share their visions of the future.

At the end of this new century, will we be able to look back on the elimination of hunger, on a beautiful, flourishing natural environment, and above all, on the achievement of health and prosperity for everyone on this planet? I am convinced it is possible, if we all put our shoulders to the wheel. In short: let's get to work!

Louise O. Fresco,
President of the Executive Board of
Wageningen University & Research

FOOD SECURITY

CGIAR grants for six WUR researchers

Six Wageningen researchers have received grants from the Dutch Organization for Scientific Research (NWO) for research within CGIAR, a platform of 15 international research institutes in the field of food security. Marrit van den Berg, Inge Brouwer, Erwin Bulte, Ruerd Ruben, Jeroen Groot and Marc Verdegem each got more than 150,000 euros to collaborate for three years with the agricultural research institutes that make up the Consultative Group on International Agricultural Research (CGIAR). The research projects focus on fighting poverty, improving nutrition and food security, and improving access to natural resources. For example, Jeroen Groot will assess and harmonize the agro-ecological models used at various CGIAR institutes, while Marc Verdegem will study the ecological intensification of fish farming in partnership with the CGIAR institute WorldFish.
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PHOTO CGIAR

GREENHOUSE HORTICULTURE

Growing cucumbers at the South Pole

PHOTO ISS HARALD REINTSCH

Wageningen scientists have developed a closed-cycle greenhouse system that could provide the crew of a space station with fresh produce. The greenhouse is being tested on a 'mission' to Antarctica.

WUR is involved in a year-long European test space mission at the South Pole. The Greenhouse Horticulture business unit has developed a special greenhouse that could provide fresh vegetables in the future for the International Space Station (ISS) or other space missions. At the start of 2018, the greenhouse was erected and put to use at a test station in Antarctica. Using a cultivation manual that the Wageningen researchers also produced, the 10-person crew have now harvested 157 kilos of tomatoes, cucumbers and lettuce. Cameras keep track of the crops' growth rates and detect any deviations. In the event of problems, the Wageningen experts advise them. Photos, explanations and updates can be found at http://eden-iss.net/.
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RANKINGS

Satisfied students, high score in rankings

Wageningen students are the most satisfied with their degree programme compared with students at other universities, according to the 2018 National Student Survey. Wageningen students give their programme a score of 4.26 out of 5, compared with the national average of 4.05. In the international Times Higher Education ranking, Wageningen University & Research rose five places to position 59. WUR is the second-highest Dutch university in the ranking behind Delft University of Technology, which climbed from 63 to 58. The ranking covers 1250 academic institutions around the world. The National Taiwan University ranking puts WUR top in the world for agriculture, environment and ecology. Wageningen is ranked second for plant and animal sciences.
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CENTENARY

The minister of Education, Culture and Science, Ingrid van Engelshoven, brought Wageningen University & Research's centennial celebrations to a close on the evening of Friday 9 November when she unveiled a seven-metre-tall carillon. This new acquisition for the campus, a gift from University Fund Wageningen, Kadans Biofacilities and a number of alumni, will play on special occasions. The idea for the bells came from emeritus professor Rudy Rabbinge.

A week earlier, another reminder of Wageningen's centenary saw the light of day: a commemorative five euro coin that the Royal Dutch Mint is issuing to honour 100 years of university education in Wageningen. Jeroen Dijsselbloem, an alumnus and former Finance minister, struck the first example.
The coin marks a special year for the Wageningen community. The centenary was celebrated on a large scale around the world with alumni gatherings, conferences, exhibitions, art, films and a book about the organization's last, eventful 25 years. At the close of the centenary year, the President of the Executive Board Louise Fresco shared her vision of Wageningen University & Research in 2118. Hopefully, Wageningen will then be able to look back on the elimination of hunger, a revival of nature and a healthy life for all on this planet.
The campus will have changed beyond recognition with the carillon as a cherished relic from the past. *www.wur.nl/100years*

HUMAN NUTRITION

Consumers prefer their low-calorie products in red

Manufacturers often sell their low-calorie products in light blue packaging, but consumers prefer warm, bright colours such as red and orange, as PhD candidate Irene Tijssen discovered. In a computer game, the participants in her study said they found the yoghurt drink packaging in warm, bright colours more appealing than the light blue packs. Tijssen also made brain scans of the participants during the game. 'We saw more activity in the part of the brain that is linked to reward when they saw the packaging with warm, bright colours,' says Tijssen. She conducted the research, which is all about encouraging healthier choices, in collaboration with Unilever and FrieslandCampina.
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PHOTO SHUTTERSTOCK

WAGENINGEN ACADEMY

Global Future Farming Summit

The second Global Future Farming Summit took place on the Wageningen Campus on 6 November. More than 100 participants from all over the world registered for this event. Based on last year's success, ProAgrica and Wageningen Academy joined forces again in order to offer Food & Agribusiness professionals from all over the world a chance to gain new insights and learn about the latest developments in Food & Agri. The newly added Experience Tour programme offered participants a great opportunity not only to visit several WUR research facilities but also to talk and exchange ideas with WUR experts and each other.
More information: www.wur.eu/academy

NATURE

Almost half of Dutch plant species are struggling with the heat

PHOTO BUITENBEELD

The Netherlands has already become too warm for around 100 plant species. If temperatures were to rise by a further four degrees, nearly 500 plant species would be in trouble. That poses dilemmas for nature management.

Temperatures average about 10 degrees Celsius over the year in the Netherlands. The KNMI's climate scenarios show that the average annual temperature may rise to 11 degrees or even 14 degrees by 2085. Wageningen Environmental Research has taken more than 6000 European plant species and determined the temperature zones where they are found. Around 1200 of these species grow in the Netherlands. The Netherlands is actually already too warm for 102 plant species, such as peat mosses and the dwarf cornel. If the average annual temperature increases to 11 degrees by 2085, 162 species will be in trouble. A rise to 14 degrees could lead to the loss of 490 plant species, 40 per cent of all species in the Netherlands. That number includes 180 species on the Red List of threatened plants, such as the wild strawberry and the star gentian.

On the other hand, there will be new plants coming in from the south. Around 200 new species could take hold here if temperatures rise to 11 degrees, or even 1000 species if they reach 14 degrees. That depends, though, on how fast a species spreads.

The future shifts in vegetation will have consequences for nature management, say the researchers. Does it make sense to protect threatened species we may be losing anyway? There is also the question of whether and how we should prep are for the newcomers. The first climate refugeeshave already arrived, including the extremely poisonous water hemlock.

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EDUCATION

Certificates for first online Master's students

The first students to complete an online Master's at Wageningen University & Research graduated in October 2018. They are three Plant Breeding students and one student of Nutritional Epidemiology and Public Health. The graduates combined the online Master's with their part-time jobs. That demands discipline, say the brand-new alumni.

The contact with their fellow students via the online forum went well, as did the digital contact with the teachers. Wageningen has three online Master's: Plant Breeding, Food Technology, and Nutritional Epidemiology and Public Health. The workload is about 20 hours a week and the programmes take three to four years.

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PHOTO GUY ACKERMANS

CLIMATE

Mukusi trees are growing more slowly

PHOTO SHUTTERSTOCK

Climate change is slowing the growth of the mukusi tree in Zambia, PhD candidate Justine Ngoma discovered. She studied the relationship between the size of the annual rings of felled trees and the temperature and rainfall.
Zambia is becoming hotter and drier. In future, the slowdown in growth could pose a threat to the Zambian timber industry. The wood of the mukusi tree, also known as Zambezi teak, is used to make railway sleepers and furniture. The tree species grows in a small area in southern Zambia and the bordering regions of its neighbours Angola, Namibia, Botswana and Zimbabwe. The research was carried out in collaboration with Zambia's Copperbelt University, among others. The results were published in the scientific journal *Dendrochronologia*.
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CITIZEN SCIENCE

Photos of wild animals online

The Hoge Veluwe National Park and WUR have jointly developed 'Snapshot Hoge Veluwe', which shows photos of wild animals taken by camera traps. Everyone can help identify the animals. These images are now available globally via www.zooniverse.org, an online platform for citizen science. You can also visit the Dutch website: www.hogeveluwe.nl/snapshot.
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PHOTO SHUTTERSTOCK

ENVIRONMENTAL TECHNOLOGY

New approach to medicine residues in wastewater

Researchers in the Environmental Technology chair group have selected three promising methods for removing medicine residues from wastewater.
A closed purification system with manganese and bacteria turns out to be suitable for breaking down diclofenac residues.
A marsh system with plants and sediment could be an effective option for removing other medicines from wastewater.
A third method consists of a three-phase purification process with a biological reactor, ozone and bacteria. Water boards, engineering consultancies and drinking water companies are involved in the projects. New affordable and effective medicine purification systems are expected to be on the market within five to ten years.
Medicine residues in the surface water cause a lot of problems, for example with fish changing sex due to oestrogen from contraceptive pills, or vultures getting kidney failure and dying after consuming the painkiller diclofenac, as happened in India.
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FISH STOCKS

Still not enough eels

The Dutch eel population has increased slightly but is still too low. An evaluation by Wageningen Marine Research shows that mortality caused by humans has been reduced substantially since the introduction of the Dutch eel management plan in 2009. Even so, there are too many deaths and not enough eels are returning to the sea. Eels have been seriously endangered in Europe for years.
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METEOROLOGY

Cities are windier

Towns and cities are sometimes windier than the surrounding countryside, found researcher Arjan Droste. He calls this surprising phenomenon the wind island effect.

'Average wind speeds can be higher in the city than in the countryside, even though the wind there can blow freely and isn't blocked by buildings,' says PhD candidate Arjan Droste. The effect is small and mainly occurs in the afternoon with a light wind and low buildings. The researcher calls this the wind island effect, analogous to the heat island effect. The effect is caused by the air in the atmospheric boundary layer just above the earth's surface mixing with the air in the troposphere above that. 'That increases the wind speed. The acceleration is different above a city than above the countryside because the boundary layer is thicker above cities,' explains Droste. He says it is important to take the wind island effect into account when measuring air quality and the production from wind energy.
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PHOTO GETTY

ENVIRONMENT

Breaking down PAHS requires a lot of patience

PHOTO ROEL SLOOTWEG/SHUTTERSTOCK

Polycyclic aromatic hydrocarbons (PAHs) in contaminated sludge break down of their own accord eventually if they have enough oxygen. This finding comes from a long-term study.

Dredging work in watercourses produces a lot of sludge that is contaminated with polycyclic aromatic hydrocarbons. These PAHs, which can be carcinogenic, are produced by the incomplete combustion of materials containing carbon, for example in coal gasification or when burning fuel. In 1994, Wageningen started a study for the Dutch government and the Rivierenland water board on the biodegradation of PAHs in contaminated dredge spoil. Back then, contaminated spoil was stored in low-oxygen depots, often in the sea or lakes. That had the opposite effect to what was intended. With enough oxygen, microorganisms will break down the PAHs almost entirely in 20 years, found the researchers Joop Harmsen and René Rietra. So contaminated sludge will eventually become purified. 'If you have a contaminated site, you need to manage it so as to allow oxygen access,' says Rietra. Targeted use of the soil in a way that increases the oxygen content can bolster the biodegradation, he explains. 'For example, growing rape as an energy source or willows on the dredge spoil, or nature development. You can use it for another purpose later, when the soil is no longer toxic.'
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NATURE MANAGEMENT

Counting big game with drones

Researchers have developed a new, cheap method for counting big game such as gnu and oryx in a nature reserve in Namibia. They are combining drone flights with automated image analysis.

'Counting game is a huge challenge,' explains Devis Tuia, professor at the Wageningen Laboratory of Geo-Information Science and Remote Sensing. 'Automating the process makes it easier to collect accurate, up-to-date information.' He worked with biologists at the Kuzikus Wildlife Reserve in Namibia and a group of Swiss colleagues to develop a new method.
Drones take photos of the game from a distance. Object recognition software then analyses the images and the results are verified by humans.
The animals are sometimes difficult to distinguish from the bushes and rocks, but the software has used deep learning to master this task. First, around 200 volunteers counted the animals in thousands of aerial photos of the reserve. The system analysed these images and learnt to recognize and count the animals. The software also flagged unclear observations so that they could be checked by humans.
With this method, it takes one person just one week to carry out a count of the Kuzikus reserve, which covers about 100 square kilometres. In the past, the count required a team in a helicopter, which was both expensive and not very accurate. The study was published in July in Remote Sensing of Environment.
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PHOTO ALAMY

LIVESTOCK RESEARCH

Routine is best for cows

Cows that eat well and have a fixed feeding pattern are healthiest after calving. The same applies to cows with a fixed day-and-night rhythm. These are the results of a study by Ingrid van Dixhoorn on susceptibility to diseases among cows that have recently calved. Cows often have lower resistance after giving birth to a calf, which can lead to a lack of energy or udder and uterine infections.
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MARINE BIOLOGY

Slightly less plastic in fulmars

The amount of plastic in the stomachs of northern fulmars that wash up on the Dutch coast has fallen slightly. Unfortunately the rate of decline is very slow, Wageningen marine biologists conclude. They are monitoring the quantity of plastic in fulmars as an indicator for the Dutch and European policy aimed at reducing the amount of plastic in the sea.
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CITIZEN SCIENCE

European research on pesticides and bees

Wageningen researchers will be developing an international protocol for Europe-wide citizen science looking at the exposure of honeybees to pesticides. The EU has made 1.5 million euros available for a pilot study. The researchers will study examples from actual practice of research on honeybee populations and develop a model that shows how bees search for food in various landscapes. The idea is to end up with a citizen science project for tracing the use of pesticides, for example based on pollen.
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Circular agriculture has already started

Around 150 Dutch farmers are already trying to close cycles on their farms, despite the strict manure rules standing in their way. Minister Carola Schouten wants to remove those obstacles. She believes the Netherlands should lead the way in circular agriculture. Wageningen is itching to get started.

TEXT ALBERT SIKKEMA **ILLUSTRATIONS** RHONALD BLOMMESTIJN

A modern poultry barn covered with solar panels stands near Castenray, a town in northern Limburg. It houses over 20,000 chickens that roam around and lay an egg a day. Welcome to Kipster, 'the most animal-friendly, people-friendly and environmentally friendly poultry farm in the world' according to the website.

Wageningen alumnus Ruud Zanders, co-owner of Kipster, explains the basis for the claim. The chickens are fed with waste from the food industry, including cookie remains. The young cockerels, which are normally gassed, are raised here for meat; the egg production is climate neutral and the concentrations of fine particulates are low. The most important thing: the chickens don't eat any products that we could have eaten. 'It is >

unethical and inefficient to feed our chickens perfectly decent grain when millions of people are starving,' says Zanders.
'The pigs and chickens have to eat up the leftovers, just as they did in our grandparents' day.'
He got the scientific evidence supporting this approach from Wageningen researcher Hannah van Zanten, who obtained her PhD in 2016, with Imke de Boer as her supervisor, on the role of animals in a sustainable food system. 'Kipster has been going for over a year now and we work closely with the Animal Production Systems chair group. A while ago we had a discussion about rice bran layers: is that a waste product from producing white rice or human food that you shouldn't use as animal feed? That's something we ask Hannah.'

LEADING THE WAY

Kipster fits perfectly with the minister Carola Schouten's new vision for farming's future: *Agriculture, Nature and Food: Valuable and Connected* (see inset). She wants the Netherlands to lead the way in circular agriculture. 'In a circular agricultural system, in principle arable farming, livestock farming and horticulture make use of raw materials from each other's sectors and waste products from the food industry and food supply chains,' she writes in her vision. 'In principle, livestock should be fed on grass, feed crops or crop remains from the farm itself or the local area.'
Schouten's intention with this vision is also to use circular agriculture to resolve various modern-day problems in agriculture, which is currently geared to the global market and low costs. The idea is that circular agriculture will lead to less environmental harm, greater biodiversity, higher incomes for farmers, less wastage of raw materials and food, and lower greenhouse gas emissions. These points will serve as a kind of checklist for testing the effect of the new circular policy. Schouten presented her vision in September at an organic dairy farm near Delft.
Wageningen University & Research was a key adviser to the minister. Martin Scholten in particular, the director of the Animal Sciences Group in Wageningen, has turned out to be an important ambassador for circular farming in the past two years. He prepared the ground in January 2017 during a debate with politicians, businesses and civil society organizations in The Hague, where he made the case for a radical transformation to circular agriculture in which the feed for livestock farming comes entirely from grass and food remains.
Six months later, Scholten and two Wageningen colleagues got the Parliamentary Committee on Agriculture up to speed on circular agriculture. At present, the farming sector is very efficient from the perspective of the products — butter, cheese and eggs — but it is also causing climate change and reducing biodiversity. Scholten argued that circular agriculture should tackle the issues of food, the climate and biodiversity as an integral whole. In the past few months, he has attended countless meetings of farmers, civil society organizations and researchers to explain his viewpoint.
Scholten bases much of his vision on the work of the Animal Production Systems group in Wageningen. Professor Imke de Boer and her group have developed a food system approach in which high-grade feed such as maize and cereal that is also suitable for human consumption is no longer fed to pigs and chickens as this is not an effective way of utilizing raw materials. It is more sustainable if we only use arable land for producing plant crops for humans, say De Boer and Van Zanten. Livestock farming should only use low-grade feed: grassland — as humans can't eat grass — and waste products from the food supply chains.

23 GRAMS OF PROTEIN

Circular agriculture using grassland and waste products would be able to produce about 23 grams of animal protein per head of the world population per day, thinks De Boer. That is around half of what Europeans currently consume daily in

'The pigs and chickens have to eat up the leftovers'

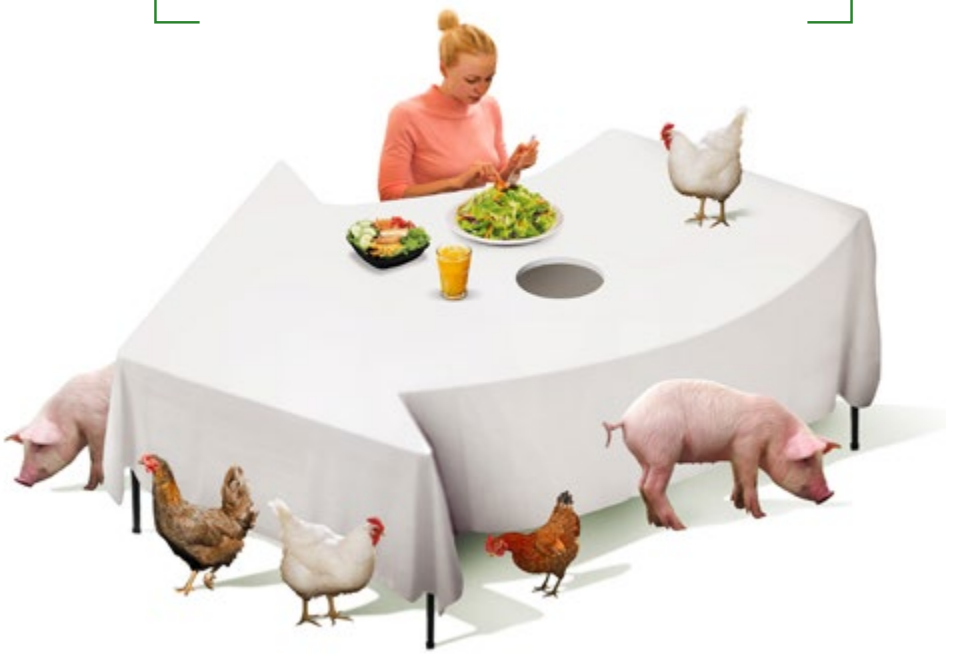


PHOTO ANP

CHARACTERISTICS OF CIRCULAR AGRICULTURE

According to minister of Agriculture Carola Schouten's vision paper, the farming sector should aim to reduce its consumption of raw materials through more efficient utilization in closed cycles.

- Arable farming, livestock farming and horticulture should use raw materials that come from each other's sectors and from the food industry (crop remains, food remains, processing waste, manure, compost).
- Livestock should be fed with grass, feed crops or crop remains from the farm itself or the local area, and waste products from the food industry.
- Processed animal manure should be used on the land, and as little synthetic fertilizer as possible.
- Circular businesses should use renewable energy wherever possible.

animal protein. This diet is actually more sustainable than a vegetarian diet, she claims, because vegetarians do not use the waste products and grass for food production. The professor argues that you need livestock farming for effective circular agriculture.

A major bottleneck for circular agriculture is that many waste products from the food supply chain are currently banned from being incorporated in animal feed. A ban was introduced in 2003 on feeding kitchen waste and food leftovers to cows, pigs and chickens. What is known as 'animal meal' — finely ground carcasses and other animal remains — is also not allowed in animal feed, in part because of the risk of BSE (mad cow disease). De Boer says those rules need to be reviewed. She points to Japan, where 35 per cent of food waste is processed in feed for pigs. 'If you heat that waste properly, it's safe and a very nutritious alternative to maize and soya beans.'

The minister, Schouten, wants an end to the legislation that is holding back circular agriculture, but her vision for livestock farming is less radical than De Boer's. Whereas De Boer is aiming to minimize the use of animal feed that is also suitable for human consumption, the minister mainly wants livestock farmers and arable farmers to collaborate in closing the cycle. Livestock farmers should supply manure to the arable farmers, who in turn provide animal feed to the livestock farmers. That animal feed should be grown nearby and replace imports of soya from Brazil, is the idea. The manure should also be supplied to nearby farms.

A point for discussion is the geographical extent of the closed-cycle chains: are we talking about local, regional or international closed cycles? That still has to be worked out in specific policies.

Take animal feed. At present it is cheaper for livestock farmers to buy imported soya meal from Brazil than animal feed from a local arable farm, says Oene Oenema, professor by special appointment in Nutrient Management. If we replace those imports with Dutch soya, and maize and cereals from north-west Europe, feed prices will increase. The cultivation of Dutch soya will also have consequences for arable farming. 'Maize and soya are useful feed crops but you don't want them taking up half of the Netherlands,' says Oenema.

There is another complicating factor too, says the professor. Dutch animal feed imports don't just consist of rainforest-destroying soya, as is often thought. 'Our feed manufacturers are very smart and scour the global market to produce good, cheap animal feed,' says Oenema. 'They use over 20 different waste products such as orange peel and palm kernels, which they turn into high-quality animal feed. That is a circular economy but on a global scale. What do we plan to do with that?'

SURPLUS MANURE

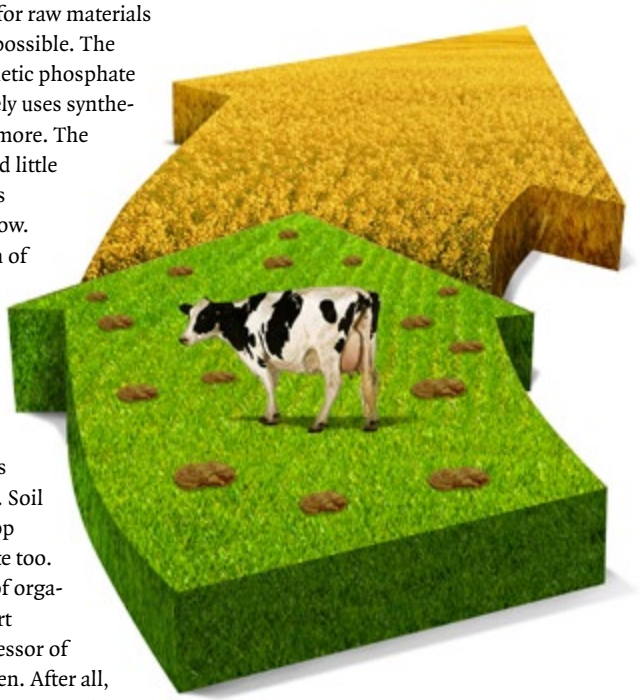
Then there is the manure, currently a real pain in the neck for Dutch livestock farming. In circular agriculture, all manure has to be turned into high-grade raw material for pastures and arable farming — but how? At the moment, a quarter of all manure produced in the Netherlands is exported to surrounding countries, says Oenema. 'If the Netherlands stops exporting manure, we would have to reduce the livestock population by a quarter in order to avoid having a manure surplus.'

But this story is somewhat more complicated too. Dutch farmers currently use synthetic fertilizers as well. The new circular vision requires a reduction in the use of synthetic fertilizers so that farming uses fewer raw materials. That would lead to an increase in the demand for animal manure in the next few years, which could create room for more livestock after all, predicts Oenema. These positive and negative factors determine >

the eventual 'room for manure'. The rule here is that all the manure should end up in the place where the animal feed is produced — in order to close the cycle. But do arable farmers want that manure? Oenema says livestock farmers should separate their manure out into a solid fraction — with phosphate and fibres — and a liquid fraction — with nitrogen and potassium. The professor expects this will let them deliver nutrients tailored to meet arable farmers' needs, which will make the manure valuable.

PRODUCING ANIMAL FEED

Wageningen's experimental farm De Marke is trying out a number of these circular principles. De Marke is a dairy farm that produces its own animal feed. Manure and minerals are used as efficiently as possible so that the requirements for raw materials and energy are as low as possible. The farm stopped using synthetic phosphate fertilizer in 1993 and barely uses synthetic nitrogen fertilizer anymore. The cows eat a lot of silage and little concentrate, so the farm's ammonia emissions are low.
De Marke offers one form of circular agriculture for dairy farming but the circular approach has to apply to arable farming too. Good soil is fundamental for circular agriculture, states the minister in her vision. Soil quality affects not just crop production but the climate too. Good soil contains a lot of organic matter, explains Lijbert Brussaard, emeritus professor of Soil Biology at Wageningen. After all, soil with a lot of organic matter is able to absorb water and cope much better with drought. He quotes approvingly from the minister's circular vision: 'Such a soil can also hold more nitrogen and minerals; it sustains a richer soil life and helps produce healthy crops'. Farmers can help reduce CO_2 emissions by fixing carbon in the soil in the form of organic matter, he explains. Ploughing less is an important measure because ploughing causes carbon compounds in the soil to come into contact with oxygen, resulting in the creation of CO_2. The more climate-friendly alternative is called non-inversion tillage. Furthermore, carbon is fixed by growing crops with deep roots, such as cereals, rather than crops that put out shallow roots, such as potatoes, so farmers have to take that into account in their cultivation plans. Brussaard also sets requirements for the quality of the manure. 'Slurry is not good enough; aged manure with straw is much better for the soil.'
At the Agroecology and Technology Test Location in Lelystad, WUR is working on the arable farming approach sketched by Brussaard. The experimental farm stopped ploughing nine years ago and aims to 'use ecology's regulating capacity in agriculture,' as researcher Wijnand Sukkel puts it. By practicing shallow tillage or not ploughing at all, they have increased the organic matter content of the soil considerably.w
This year, the farm started strip cultivation with potatoes, sugar beets, a mix of grass and clover, carrots, wheat, flowers and onions. In principle, the application of strip-cropping should result in fewer diseases and pests because there are more natural enemies of the pests on the plot than in a monoculture. Biodiversity and soil quality are the points of departure for this nature-inclusive experimental farm that was officially opened as a test location in September. It can provide the building blocks for the new circular policy.



OBSTACLES

Circular agriculture has actually been practiced for a long time on individual farms. Frank Verhoeven, who advises farmers through his company Boerenverstand, knows of around 150 Dutch farmers who apply circular principles on their farm. Those farmers have a hard time, says Verhoeven, because current agricultural policy stands in the way of circular farmers. Like Scholten, Verhoeven also talked last summer to the coalition parties and the minister about both the obstacles to circular farming and the opportunities.
The dominant course of producing as much as possible as cheaply as possible for the global market has left its mark on policy, says the alumnus, who graduated in Animal Sciences in Wageningen 20 years ago. 'What is more, regulations primarily focus on parts of the system,' he says, quoting from the

'Aged manure with straw is much better for the soil'

‘At present, nobody pays the bill for producing waste’

circular vision document. For example, in the policy on the environment, sustainability is interpreted as minimizing the environmental damage per kilo of meat, litre of milk or kilo of potatoes, which makes intensive production appear the best solution. Circular farmers on the other hand aim to minimize the use of raw materials for their farm. They interpret sustainability as low environmental damage per hectare. These are low-input dairy farmers, says Verhoeven, who use little or no synthetic fertilizer and concentrates, and mainly use their own grass as animal feed. They produce as much milk as intensive farmers, but with one more cow. However, the ammonia and phosphate laws put limits on the number of cows. Under that legislation, farmers who produce as much milk per cow as possible have an advantage. What is more, policy rules form an obstacle to ageing manure and using it to improve soil fertility. The Use of Fertilizer Decree states that farmers have to inject slurry into the soil whereas circular farmers prefer to spread manure on top of the soil. The Low Ammonia Emission Animal Housing Systems Decree says cows should be kept in closed barns to minimize emissions of ammonia and greenhouse gases, whereas circular farmers want to compost their manure.

PIONEERS

Bieslandhoeve in Delfgauw, where the minister presented her circular vision, is an open straw barn where the manure is composted. ‘That is the ideal barn for both soil and cows, but the ministry assigns this barn system the highest emissions factor, so no farmer will want to build one,’ explains Verhoeven. The minister wants to remove obstacles but she does not yet have any concrete legislation. She does promise in her vision that she will give ‘the pioneers strong support from now on for the innovations, experiments and investments in a closed cycle that they have already made in the past few years.’

But policy alone is not enough; circular farmers also need a business model. If the current economic system does not change, food production looks set to remain a race to the bottom, with low prices and food wastage. We therefore need to encourage the circular approach through higher prices, thinks Wageningen economist Krijn Poppe. ‘Current prices are not a good indicator for what we are doing. At present, nobody pays the bill for depleting global phosphate stocks or for producing waste and greenhouse gases. If you let businesses and consumers pay the real costs, you will automatically end up with optimum closed cycles. That debate about local or global closed cycles will be resolved automatically.’

You could for example increase the value of manure with new rules, says Poppe. He suggests that livestock farms could introduce a money-back system for the minerals in the animal feed. Farmers who buy this feed should be able to deliver the manure from the cows that ate the feed to the animal feed factory and get money back. The economist thinks that would close the mineral cycle between animal feed producers and farmers. Kipster founder and agricultural economist Ruud Zanders thinks people overly complicate the business model for circular farming. ‘It’s very simple. You calculate the unit cost, add a margin and you get the sale price. Then you go to a potential customer with your story and ask them whether they want to buy at this price. Our first step was to arrange the contract with Lidl; without that sale contract, we wouldn’t have started.’ Kipster will be taking the same approach for a planned second location in the Netherlands and one in Belgium for the production of eggs — first sort out the sales, then the licences, then build the farms. He will be sticking to the circular concept. ‘The European food industry produces around 115 million tons of waste annually. At the moment, only 4 to 5 million tons are used for animal feed. There is still lots of potential there.’ ■

www.wur.eu/circularfood

Producing chocolate sprinkles at Delicia in Tilburg.

Less sugar, but nice and

The producers of cookies, sweets and other confectionery could do more to reduce the amount of sugar in their products. Twenty companies received advice on this from Wageningen Food & Biobased Research. 'Now we can put 20 to 30 per cent less sugar in our chocolate sprinkles'.

TEXT RENÉ DIDDE **PHOTOGRAPHY** NICOLE MINNEBOO

'Look, here we are pressing the cocoa solids through those little holes. Thin spaghetti-like strands come out the other side,' demonstrates Gertjan Lok, R&D manager at Delicia and a Wageningen Food Technology graduate. The air in the chocolate sprinkles factory in Tilburg smells of strong, dark chocolate. 'We can now add 20 to 30 per cent less sugar, without blocking up the holes. If we reduce the sugar any more than that, the dough becomes too fatty for the press,' says Lok. And there is another reason why too fatty is not good. A bit further down the production line, a shiny layer is added to the sprinkles. 'If they are not dry

sweet please

enough, that process doesn't work,' says Lok.

ALWAYS DELICIOUS

Delicia has been making chocolate sprinkles for years for nearly all the supermarkets' own brands, each with their own recipe. 'We have been wor king on alternatives to sugar in sprinkles for a long time, but of course we have to do that in consultation with our clients,' says Lok. 'Sooner or later, whether voluntarily or through legislation, we'll all be using less sugar and we want to prepare for that. And of course, the sprinkles must still be delicious.' Delicia received advice from Wageningen University & Research on how to adapt the production process. The chocolate sprinkles producer was one of the 10 small to medium enterprises invited by the ministry of Public Health and Sport to spend a day with a Wageningen expert exploring the options for reducing or replacing sugar.

This service came out of a 2014 agreement on improving the composition of products between the ministry of Public Health and the food industry. Companies drew up plans for reducing sugar, saturated fat and salt, with the aim of creating a healthier range of products. Most people in the western world consume too much sugar, fat and salt, with obesity and diabetes as the most widespread harmful consequences.

SMALL STEPS

The industry's plans for sugar reduction are being tested by a scientific advisory committee. 'What is coming out of that is that, with a few exceptions, the ambitions are too low,' says Joost Blankestijn, programme manager at Wageningen Food & Biobased Research. Cutting down is not easy, he explains. One of the problems is that consumers have to get used to 'light' or 'zero' products. 'So producers will have to reduce the amount of sugar in sweets and baked goods such as cookies and cakes in small steps, so >

that consumers actually don't notice,' says Blankestijn. And preferably, all companies should join in, so that consumers can't switch to a cookie, cake or brand of sprinkles made by a producer that hasn't started cutting down on sugar. Cutting down in stages eventually results in a drastic change in taste, but people get used to that, as anyone knows who has accidentally been given a cup of coffee with sugar and is disgusted, whereas there was once a time when they wouldn't have done without that sugar lump.

SOGGY CAKE

Cutting down on sugar has an impact on the technical side of production too. Sugar crystals play an important role in the structure of the product, explains Blankestijn. 'Sugar has a crucial impact on moistness and creaminess during the baking process. A cake with less sugar is usually denser .' Sugar levels affect the 'water activity' too. If you leave out the sugar, the cake is too moist. Apart from the effect on the flavour and texture, it is then more vulnerable to micro-organisms, says Blankestijn. 'So sugar affects the shelf life too.'

These technical characteristics of sugar were tested and scrutinized by Wageningen researchers at the factory of cake manufacturer Peijnenburg. 'The company actually wanted to create a sugar-free gingerbread of the kind typically eaten at breakfast in the Netherlands. We discovered that the natural sugar substitute xylitol, which is extracted from the birch tree, could be turned into a suitable mixture in combination with other sugar substitutes,' says Blankestijn.

After studying the baking process, it also became clear that this alternative had no negative effects on the quality. 'The structure, the moistness and the flavour were all intact.' After three years of research and development, the gingerbread – 'Zero' – was launched on the market.

The stevia plant, with its many sweet components, is another possible option. 'But this natural sweetener is not heat-proof enough to use in baked goods,' says Blankestijn, as he leads a guided tour of a pilot bakery at Wageningen Food & Biobased Research, where this kind of research is done.

> 'The industry needs help with cutting down on sugar'

PRICE RISE

Besides changing consumer tastes and the technical properties of sugar, there is a third challenge facing producers. The Peijnenburg Zero gingerbread is more expensive than its sweet relative. 'We sometimes forget that sugar is by far the cheapest ingredient in the food industry. Any alternative is always more expensive. Even if you could make a sugar-free cake by just adding more flour to keep the original

weight, the price would go up because flour is more expensive than sugar,' says Blankestijn. 'And yet the Zero cake sells well. Consumers are willing to pay a bit extra for it and the advertising campaign is good.'
The findings of Wageningen Food & Biobased Research at Peijnenburg led to a 'white paper' earlier this year, which outlined a sugar reduction strategy. 'In it we describe how we can offer companies fast and effective combinations of sugar substitutes,' says Blankestijn. 'They can read in the report what the impact of a sugar substitute would be on the structure, texture and flavour of their product.'
At the Federation of the Dutch Food Industry (FNLI), food and health manager Christine Grit is pleased with Wageningen's advice to the federation's 20 small and medium-sized enterprises. 'Businesses need help with cutting down on sugar without affecting the quality of their product,' says Grit. 'Producers who have less in-house expertise have particular difficulty with the dilemmas they face. If you reduce sugar, for instance, and thereby increase the amount of starch in the product, you add calories. The same goes for fat as a sugar substitute.'
And then there are the legal implications of replacing sugar with an alternative sweetener such as xylitol. 'There has to be a warning on the label because of the possible laxative effect,' says Grit.

SWEET DESSERTS

The ministry of Public Health and Sport is extending the subsidized advisory service due to its success. Fifteen new companies are currently being selected. 'This time we shall not only visit them but also invite them to come to Wageningen in January for a workshop in our bakery facility. We'll demonstrate all kinds of possibilities, such as cake with no added sugar,' says Joost Blankestijn. 'We are also challenging ingredient suppliers to come and demonstrate their solutions here. And we are going to help the sector to raise the quality of the plans for improving product composition.'
Blankestijn wants to apply the sugar reduction strategy to dairy products too. 'Milk-based desserts are far too sweet. There is much to be gained there.'
At Delicia in Tilburg, Gertjan Lok had already studied the option of substituting the alternative sweetener maltitol for refined granulated sugar. 'Just like xylitol, it is a bit of a laxative. But for technical reasons too, we could only replace a relatively small proportion of the sugar with it,' he explains during a guided tour of the factory. Lok praises the Wageningen expert who spent a day at the factory going over the technical ins and outs of sugar reduction. 'We came to the conclusion that it is better to reduce the amount of conventional sugar little by little,' says Lok. 'Clients and consumers can slowly get used to it, and we can try out small adjustments to the production process to support that reduction.' Delicia can now produce chocolate sprinkles with 20 to 30 per cent less sugar. 'The main way we did that was by replacing sugar with cocoa. We haven't yet looked into whether we can reduce the sugar even more.'

MAKING THE FIRST MOVE

The product is more expensive, notes the company, as was the case at Peijnenburg. But Lok is undeterred. 'If customers don't want to pay for it, we as the producer will have to make the first move, even if our profit margin falls during the introduction phase. In the end, our customers will cooperate in getting healthier sprinkles into the shops,' he says. That is the company's philosophy. At an earlier stage, this small enterprise decided to use only UTZ-certified cocoa (guaranteeing sustainable farming and production) in its sprinkles. The representatives of the Tilburg company now bring its clients a sample of its sprinkles with less sugar and more cocoa, in the hope that they will opt for this alternative. The low-sugar sprinkles look darker. And, although no chocolate sprinkles connoisseur, I thought it was tastier and creamier than the original. ■

www.wur.eu/sugarreduction

PHOTO XXXX

JOOST BLANKESTIJN
programme manager
Wageningen Food & Biobased Research

'Consumers need to get used to light products'

GERTJAN LOK
R&D manager
Delicia

'We have to make the first move'

SUSTAINABLE DEVELOPMENT GOALS

Uniting against hunger

One in nine human beings regularly go hungry. At a recent Wageningen conference about the UN's sustainable development goals, international leading lights pondered how to tackle the problem. 'We must keep on raising this issue.'

TEXT MARION DE BOO/ALBERT SIKKEMA

In 2015, the United Nations launched 17 sustainable development goals. One of the most important goals is that in 2030 no one will go hungry anymore. In reality, the number of hungry people in the world has been increasing in recent years. The reasons, according to the UN, are the economic crisis, failed harvests due to drought and flooding caused by climate change, armed conflicts and the refugee migrations that result from them.

DIFFERENT CHOICES

How can we turn the tide? 'We must keep the issue on the political agenda and confront governments that see hunger as something normal,' said Lawrence Haddad, director of the Global Alliance for Improved Nutrition (GAIN), at the Wageningen conference at the end of August. 'If there is widespread hunger and undernutrition in a country, people start thinking that's normal, or a "curse". But it is neither. Hunger and undernutrition result from decisions and choices about the use of scarce resources. But you can make other choices too.' Haddad, winner of the prestigious American World Food Prize in 2018, was one of the keynote speakers at the international conference *Towards Zero Hunger: Partnerships for Impact*, where 600 policymakers, entrepreneurs and NGOs gathered in Wageningen at the initiative of the centenarian university. They agreed on new collaborative efforts to banish hunger and promote food security and sustainable agriculture. 'The media, civil society organizations, you and I, we must all keep on raising this issue,' argued Haddad. 'We must provide the facts about the scale and the consequences of hunger and undernutrition. And we must help governments and business to combat hunger effectively.'

'When there is widespread hunger in a country, people start thinking that's normal'

Haddad's organization GAIN is already working on this. GAIN brings governments, businesses and civil society organizations together in alliances against undernutrition. The organization is running 10 programmes in Asia and Africa that aim to get more healthy food to the most vulnerable groups, and it does research on which approach works best.

821 MILLION PEOPLE

The problem is massive. One in nine humans (821 million) were suffering from hunger in 2017, chronically consuming too few calories to lead active, healthy lives. South of the Sahara, one in four people are undernourished. In Pakistan, only four per cent of all children get enough to eat. Worldwide, 151 million children are too small for their age on their fifth birthdays, and undernutrition is the cause of 45 per cent of all child deaths under the age of five. Collaboration with the business world is crucial to banishing hunger and undernutrition, said Ertharin Cousin, former director of the United Nations World Food Programme, at the Wageningen conference. Cousin: 'During my time at the UN, I helped people get access to food. Now I teach, at

PHOTO ALAMY

A small-scale farmer in Madagascar ploughs his land so he can plant a new rice crop to sell.

Stanford University among other places. I work on political issues and the intervention options for creating sustainable development and sustainable food systems.' According to Cousin, only joint action has any chance of success. 'You need all parties in sustainable development: the local community, local and national government bodies, international organizations, companies, scientists and the development NGOs.' She sees a nice example in Rwanda. 'DSM started a factory there producing highly nutritious food for children based on maize, and working with the government, donors – the Netherlands among them – and an association of 10,000 small farmers who grow maize. With that kind of concerted action you can achieve a win-win situation. DSM is getting a bigger turnover, the farmers are assured of a market, and the children get healthy food.'

Several big companies were represented at the Wageningen conference, including dairy company FrieslandCampina and beer producer Heineken. They seek more and more collaboration with knowledge institutes and universities. In his keynote speech, Unilever CEO Paul Polman explained that companies will have to look differently at profitability and collaborative relationships with government and NGOs. 'Nowadays, waste and pollution are often more costly than sustainable development. Deforestation and climate change are more expensive than the sustainable alternatives for food production. This creates a market for sustainable development. It is already the case that sustainable food production is Unilever's main source of income. We buy more and more products from small farmers for a fair price, and we work with local partners,' says Polman. 'But Unilever can't make palm oil production sustainable on its own; you need international coalitions to do that. The decisive factor is whether the financial sector wants to invest in this. Investors should put their money into companies that use natural resources sustainably. And regional development banks should concentrate on covering the backs of companies that invest in sustainable development, instead of financing development projects themselves.' ■

www.wur.eu/zerohunger

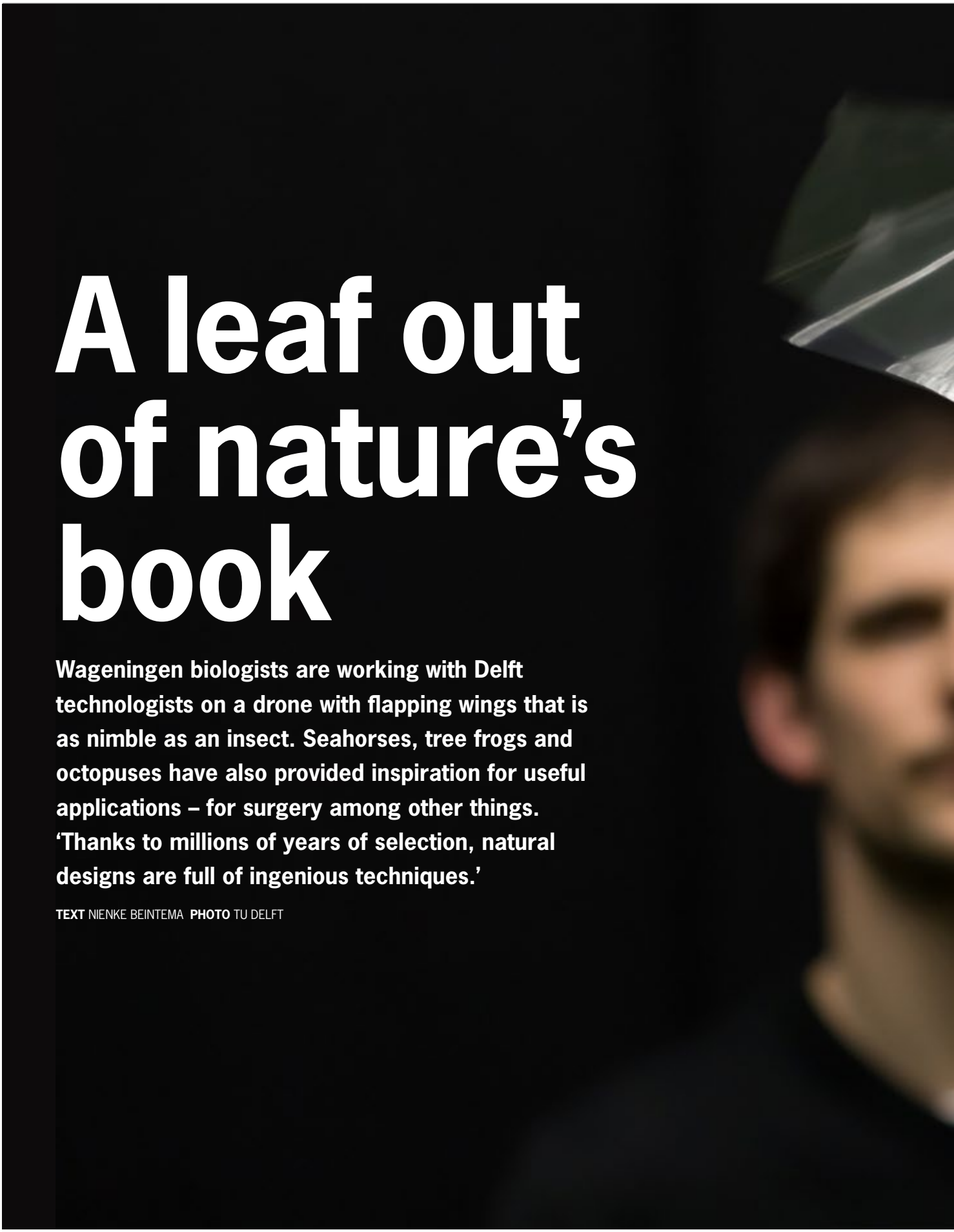
WAGENINGEN MERCY CORPS

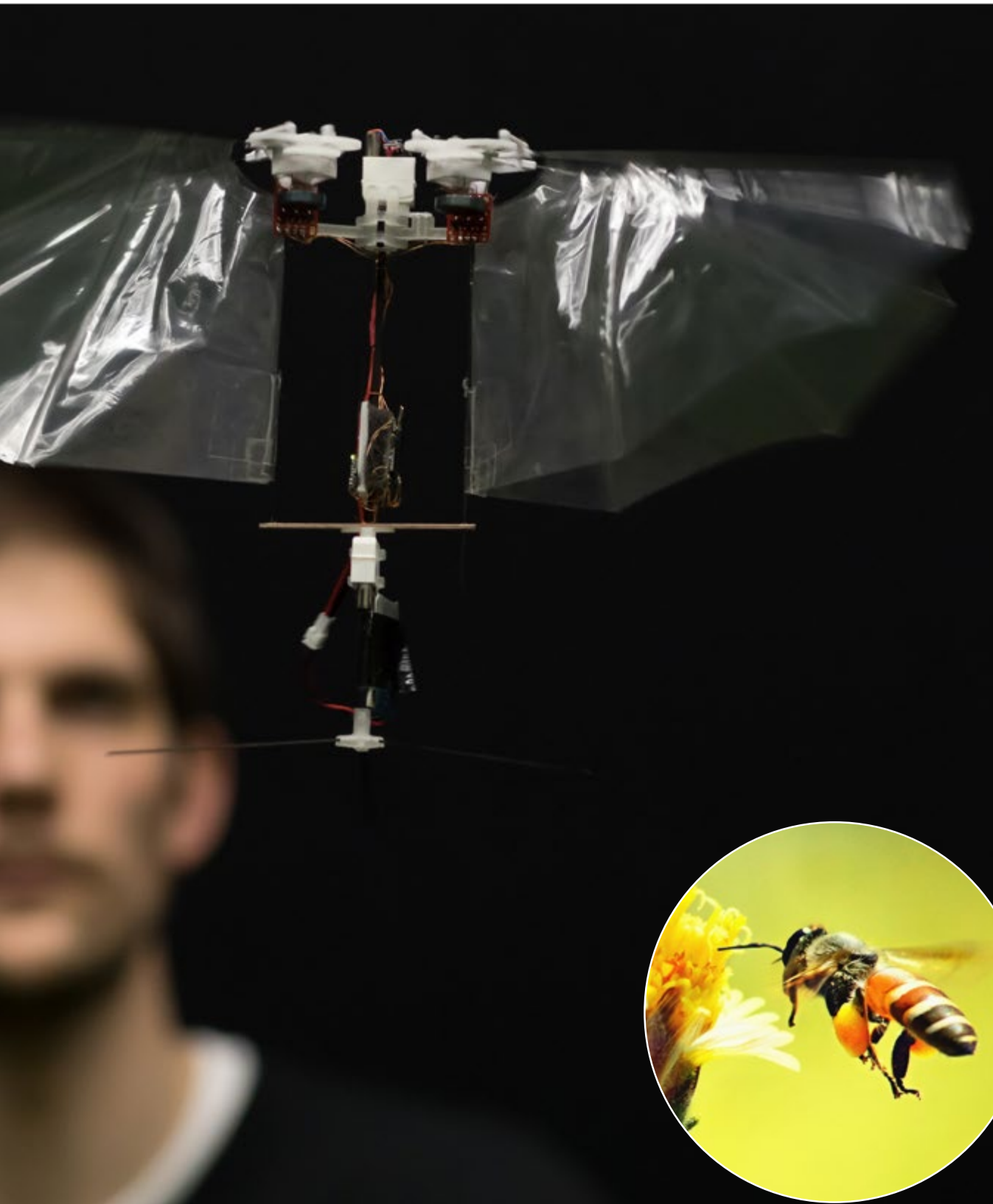
One of the new collaborations that took shape at the SGD Conference was between Wageningen and Mercy Corps. This humanitarian organization, set up in the US, has 5000 staff working in 40 developing countries, most of which are affected by conflicts and disasters. WUR and Mercy Corps are now writing a proposal for the Swiss government for a project targeting agricultural logistics and post-harvest processing in Myanmar. A sizable project is also due to start on big data and access to agricultural credit for African farmers. And there are plans for a joint proposal on sustainable agriculture in Niger. 'Evidence-based' is Mercy Corps' motto, and with Wageningen on board the organization hopes to bring in the latest know-how, as well as to research the best approach to innovative projects.

A leaf out of nature's book

Wageningen biologists are working with Delft technologists on a drone with flapping wings that is as nimble as an insect. Seahorses, tree frogs and octopuses have also provided inspiration for useful applications – for surgery among other things. 'Thanks to millions of years of selection, natural designs are full of ingenious techniques.'

TEXT NIENKE BEINTEMA **PHOTO** TU DELFT





The honey bee – which weighs only 100 milligrams and is loaded with nectar – lands with utter precision on a flower that is dancing in the wind. An extraordinary display of flying skills, which engineers would love to be able to emulate.

The honeybee, already heavily loaded with nectar, approaches the flower on a light side wind. It quickly corrects its course for a puff of wind, slows down, hovers briefly and lands precisely on the flower head as it sways in the breeze. An incredible demonstration of flying skills, certainly for a 'design' weighing 100 milligrams. Many engineers would love to manage something like that in their laboratories. They cannot do so as yet, but they are well on the way. Scientists at Wageningen University & Research and the Technical University of Delft are jointly developing a drone that flies like an insect: it is manoeuvreable, light and has flapping wings. They have already made a series of prototypes of their DelFly. The latest version was the subject of an article in the top journal *Science* last September.

'The robot helps us understand nature better'

'We are not aiming to imitate nature precisely,' says Johan van Leeuwen, professor of Experimental Zoology in Wageningen. 'And that would not be possible: those natural designs are so full of ingenuity, the product of millions of years of natural selection, that you can't copy them. What we want is to understand the mechanisms at work in nature and to get inspiration from them for the design of useful applications. We call that bio-inspired design.'

BROWSING

He cites a few classic success stories by way of example: velcro, which is based on the hooks on the burrs of the great burdock plant. Paint that is waterproof and dirt-repellant thanks to nanotechnology, a trick played by the lotus leaf. Buildings designed and positioned just like termite hills so as to catch the wind and ensure air circulation. 'This approach to design has really taken off in recent years,' says Van Leeuwen. 'It used to be very difficult to get funding for this. Now that there are more and more examples of successes, everyone thinks it's logical: browsing through the natural world in search of handy new ideas.'

The research is highly interdisciplinary. 'You use knowledge from zoology, mechanical and fluid dynamics and aerodynamics. We've got an engineer on our team with a background in Aerospace Engineering.'

That engineer is Florian Muijres. He works in Wageningen, where he is studying insects' flight strategies. His equipment for that includes a 3D camera setup which takes 13,500 frames per second. He has been working on the DelFly since 2014. 'That came out of a Delft student competition 13 years ago,' says Muijres. 'Students of Aerospace Engineering were given an assignment to design a flying robot based on nature, supervised by biologists from Wageningen and engineers from Delft. This resulted in the first DelFly, with propulsion based on that of flying insects.'

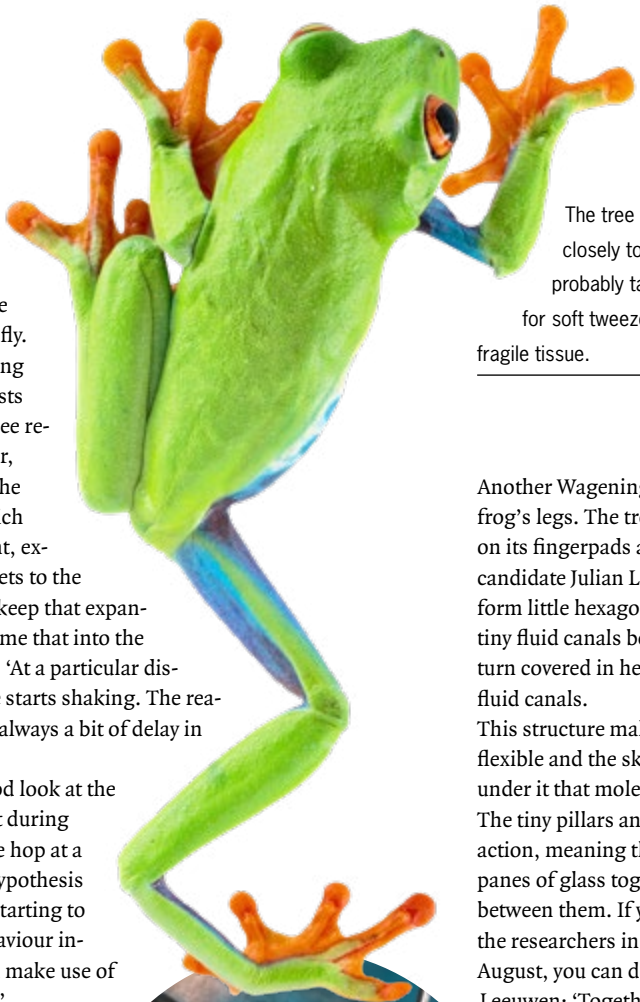
MANOEUVRABLE

'In the new prototype, the DelFly Nimble, it is not just the propulsion that is bio-inspired,' says Muijres, 'but also the manoeuvrability. Insects, birds and bats are very good at that. Just watch a hummingbird in action. It can fly both fast and efficiently, and hover and manoeuvre very deftly. You can only achieve that combination with wings that flap. The way they manipulate the air makes optimal use of the air currents.'

For a long time nobody knew how insects actually do that. A lot more is known about that now, partly thanks to modern camera techniques and computer models. Muijres: 'Once the biological knowledge was there, Delft colleagues could build it into a robot.'

The engineers also wanted to know exactly how an insect can find its way around. 'The nice thing was that we could start researching that using the robot,' says Muijres. 'If we programme it with what we think happens in an insect's brain, we can then test it to see if we're right. And you can keep on adjusting it a bit at a time and see what happens then.'

At that point you are moving from engineering territory into that of science, Muijres points out: 'The biology helps the engineers to design a robot, and then that robot helps the biologists get a better understanding of nature. That interaction is incredibly interesting. That's what makes this project so unusual and so valuable. And it's what makes a scientific journal like *Science* take an interest in a drone.'



The tree frog's flexible foot soles can stick so closely to a surface that molecular attraction probably takes place. That provides the inspiration for soft tweezers with which you can take hold of fragile tissue.

'Just look how elegantly a bee lands on a flower,' says Guido de Croon, scientific head of the Delft Micro Air Vehicle Lab. 'The lower it gets, the slower it must fly. We want to build that self-steering capacity into the robot.' Biologists came up with the idea that the bee responds to an image of the flower, which gets bigger and bigger. The bee seeks to keep the rate at which the image grows bigger constant, explains De Croon. The closer it gets to the flower, the slower it must fly to keep that expansion steady. 'But if you programme that into the drone, it doesn't work,' he says. 'At a particular distance from the target, the drone starts shaking. The reason turns out to be that there is always a bit of delay in the system.'

The biologists took another good look at the way bees land. It turned out that during landing they always make a little hop at a certain distance. 'Our current hypothesis is that the bee notices that it is starting to shake, and adapts its flying behaviour instantly,' says De Croon. 'We can make use of that moment to unfold the legs.'

SMALL FINS

Van Leeuwen sees the same sort of interaction between biologists and engineers in other bio-inspired projects in Wageningen. Research on swimming seahorses has provided inspiration for the development of an underwater robot. The seahorse has an unusual method of propulsion, pushing water away mainly with its small fins. It only uses its powerful tail to hold onto aquatic plants. In cross section, the tail is not round like those of other animals, but square. The tail consists of hard, angular discs ingeniously hooked up together: a system that makes it both sturdy and flexible. Perfect for a robot that moves over the seabed and wants to hold onto plants. 'We are working on this with the group led by Frans van der Helm – professor of Biomechatronics and Biorobotics at TU Delft,' says Van Leeuwen.

Another Wageningen-Delft project focuses on the tree frog's legs. The tree frog has complicated structures on its fingerpads and toepads, as Wageningen PhD candidate Julian Langowski discovered. The skin cells form little hexagonal pillars there with a network of tiny fluid canals between them. The top of each cell is in turn covered in hexagonal 'nanopillars' separated by fluid canals.

This structure makes the tree frog's foot sole very flexible and the skin can stick so closely to the surface under it that molecular attraction probably takes place. The tiny pillars and fluid canals also facilitate capillary action, meaning the kind of force that will keep two panes of glass together if there is a thin layer of water between them. If you combine those principles, wrote the researchers in *Frontiers of Zoology* at the end of August, you can develop new adhesive materials. Van Leeuwen: 'Together with Delft we are trying to apply this principle in soft tweezers with which you can get a grip on objects with wet surfaces, such as vulnerable tissue during an operation'.

The medical world stands to benefit from bio-inspired design in several areas. 'We have already patented the system based on the octopus tentacles,' says Paul Breedveld, professor of Biomechanical Engineering in Delft. 'That has grown into a major line of research in Delft, leading to the finest steerable surgical instruments in the world, all inspired by Johan's octopus tentacle. The spinoff company DEAM is now producing them. We expect them to be launched on the market at the end of 2018.'

STEERABLE NEEDLE

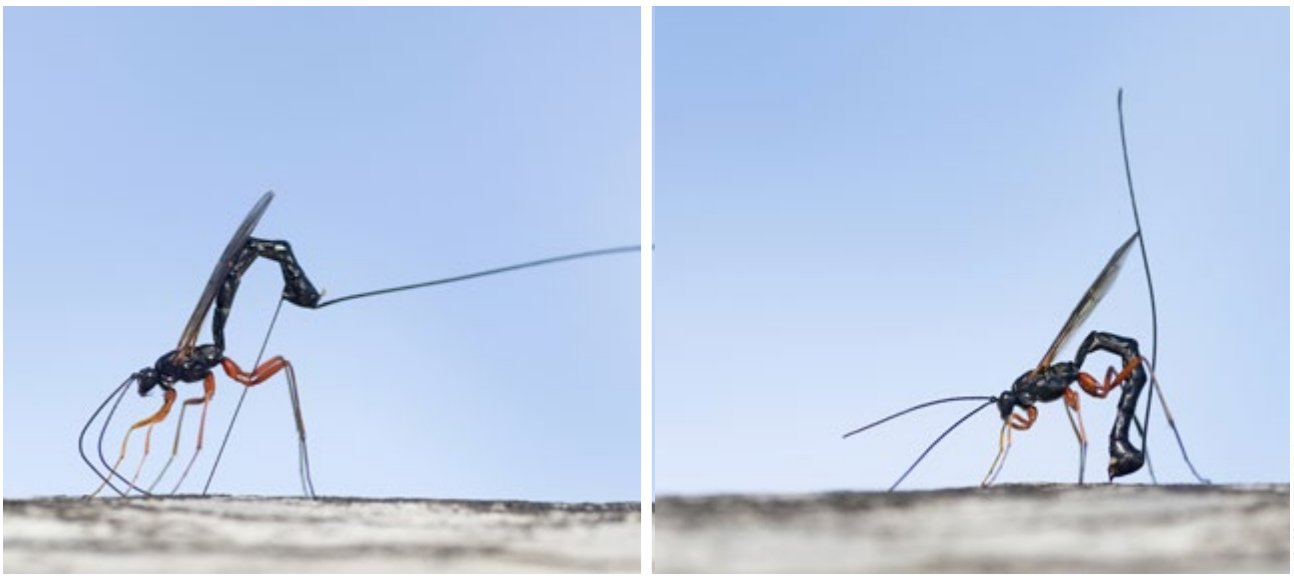
Something else doctors dream of is a flexible, steerable needle, explains Johan van Leeuwen: 'A needle that can go round a corner or even take an S bend.' This would make it possible to avoid vulnerable nerves or blood vessels when injecting a drug very locally, or when >

‘Fine, steerable surgical instruments are being based on octopus tentacles’

aiming to remove fluid or tissue. Van Leeuwen: ‘The ichneumon wasp has a solution to that.’ Ichneumon wasps lay their eggs in plants or the larvae of other insects. Some do both: using their ovipositor they drill a hole in a plant, or even in a tree, at a place where a larva is hidden. They lay an egg in the unfortunate larva, which then serves as food for the ichneumon wasp larva. ‘The ichneumon wasp can change the direction of the drilling as it goes along, explains Van Leeuwen. ‘That is possible because the ovipositor consists of three elements which hook up together lengthways.’ One of the elements forms something like rails, which the other reaches around with an extended groove. If you push one of the elements a little bit ahead of the other, the shape of the head of the ovipositor changes, causing it to go in a different direction if the head moves forward. This changes the bend in the tube. ‘Our PhD researcher Uroš Cerkvenik has filmed this at length in transparent gels,’ says Van Leeuwen. ‘They are beautiful pictures, which show that the female can drill underneath herself

ILLUSTRATION TU DELFT / TIM KRIJGER PHOTO ALAMY

Wageningen research on octopus tentacles led to the development in Delft of fine, steerable surgical instruments.



PHOTOS BUITEN-BEELD

The ichneumon wasp can drill beneath itself in all directions, without changing its own position. The system inspired engineers to develop a flexible, steerable needle.

in all directions without changing her own position. Imagine what you could do with that, in relation to tumours or in brain surgery, for instance.'
Paul Breedveld adds: 'The wasp uses a system with ridges which can't shoot out of the grooves because of their shape. We have a different solution, which is technically much easier to make: we just put a couple of little rings around our needle that keep the loose rods together.' For nature it is probably easier to make grooves than tubes, but for humans it is the other way round. 'The strength of bio-inspired design doesn't lie in imitating nature precisely, but in using nature as a source of inspiration and not being afraid to combine natural principles with smart solutions thought up by humans.'

DRILLING AROUND TUMOURS

It will take some time before doctors will be working with a needle that resembles an ovipositor. 'We've got to be realistic about that,' says Van Leeuwen. 'In the medical world there are strict safety criteria, so the testing phase is lengthy'. The same spinoff that makes instruments based on octopus tentacles is developing this concept further now too. 'After that, it's the turn of larger companies. It will undoubtedly take quite a few years, but I am sure that needles inspired by ichneumon wasps are on the way.'

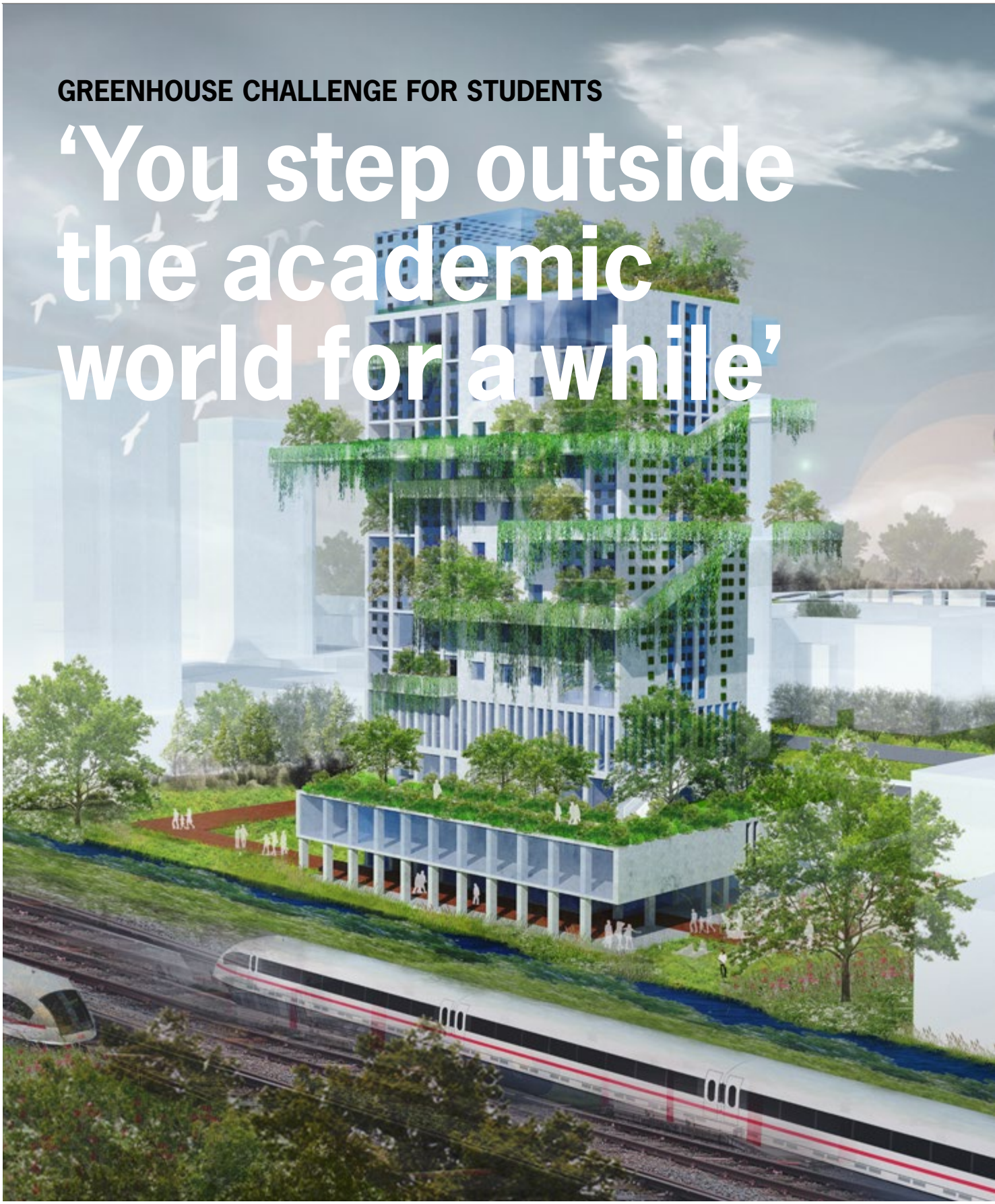
> 'Needles inspired by ichneumon wasps are on the way'

The creators of the DelFly are similarly confident: they are sure there will be flapping drones flying around one day. 'For carrying out inspections in places that are hazardous or inaccessible, for example,' responds Florian Muijres, 'such as in a factory hall, or to inspect crops in greenhouses. Standard drones are not as suitable for those tasks: they are much heavier and noisier, and they are more dangerous if they fly into people.' ■

www.wur.eu/bio-inspired-design

GREENHOUSE CHALLENGE FOR STUDENTS

‘You step outside the academic world for a while’



Wageningen University & Research challenged students to step outside their comfort zone. Their task was to develop an urban farming project for a former prison, working in interdisciplinary teams. That meant blood, sweat and tears for 24 international teams, but no study credits. 'You have to find the motivation in yourself and your team.'

TEXT LUUK ZEGERS **ARTIST'S IMPRESSION** GREENWURKS

'You are a team with a lot of different points of view, but in the end you have to develop a single concept. Getting everyone on the same page is a challenge in itself, quite apart from all the technical challenges.' The speaker is Jolien Verweij (25), a Master's student of Biology and member of Team GreenWURks, which won the first Wageningen Greenhouse Challenge. The university launched this international competition early in 2018. The aim was for students to develop the urban greenhouse of the future and the assignment: redevelop an existing building in an urban setting and turn it into an optimally sustainable total concept for vertical urban farming, with citizen participation.

IDEAL SETTING

The existing building in question is one of the tower blocks of the former Bijlmer prison in Amsterdam. A new residential and business zone is planned for the location of this prison, to be called the Bajes Quarter. When the site is redeveloped, one of the prison towers is to remain standing and be transformed into a 'green tower': a vertical urban park in which farming goes on. The ideal setting for the first Greenhouse Challenge, thought coordinator Rio Pals. 'We took an existing project and attached an assignment to it in which students themselves could explore the potential of urban farming. They needed to look for possible innovations and end up with a design for a feasible total concept.'

At the beginning of 2018, 24 teams of students from 40 universities in 10 different countries got going on this challenge. The students set about researching sustainable food production, smart energy systems, >

INSPIRATION FOR THE GREEN TOWER

Bajes Kwartier Ontwikkeling (Prison Quarter Development) is tasked by the Dutch government with redeveloping the former Bijlmer prison into a residential and business zone with about 1350 new housing units and one green tower block. The consortium got the keys of the prison on 1 March 2018, and the building has to be completed by 2024. The green tower should serve as a model of green living in the big city.
Bajes Kwartier Ontwikkeling C.V. sponsored the competition and was inspired by the pool of ideas the student teams came up with. The Rabobank was the main sponsor of the competition, aiming to stimulate the 'disruptive innovation' that is needed to feed the growing world population sustainably. For that reason, the bank agreed to be the main sponsor two more times in the next 10 years. Other sponsors included Klasmann-Deilmann, a firm that develops substrates for horticulture, and AMS Institute, which seeks to identify solutions to urban challenges.

PHOTO'S SVEN MENSCHEL

The students went on excursions during which they could examine the design location, the former prison tower, and get inspiration for new cultivation techniques and how to engage the community.

'It is evening and weekend work; it's not just an odd job on the side'

greenhouse construction, economic feasibility, the social functions of the new urban greenhouse, architecture, and more. In August the 14 best teams came together in Wageningen to present their designs in a grand finale. GreenWURks ended up carrying off the main prize, worth 10,000 euros, for their design called Open Bajes (Open Prison: see inset). The team leaders want to invest the money sustainably.

LEARNING DIFFERENTLY

The Challenge meant a different approach to learning, says Verweij. No practicals, no lectures, but rolling up your sleeves. Taking a good look at the location, asking experts questions, talking to local residents to find out what their expectations of a greenhouse in the former Bijlmer Prison would be. 'I see it as a bit similar to a year on a board at a student society. You have to attend a lot of meetings and take on different roles. I helped design the plant production system, and at the same time I was secretary to the team.'
In order to arrive at a good total concept, students from various different disciplines needed to work together, says Pals. 'You can't simply solve big, complex global problems by relying on just one discipline or just one culture. Wageningen University & Research aims to educate the leaders and changemakers of tomorrow. To do that we have to challenge students to get out of the comfort zone of their own discipline and tackle complex problems with people from other subject areas. That is one of the strengths of this Challenge.'

FIVE-HOUR DISCUSSION

Stepping out of your comfort zone was easier said than done, remarks Verweij. 'You get an assignment for which you have to build something out of nothing. Everyone brings in ideas from their own subject and background. But you've got to end up with a single design.' Verweij's teammate in GreenWURks, Yaoyun Zhang (23), adds: 'When we started, we discussed the project for five hours. After that everyone was exhausted from all the different opinions. It is tough when after such a long session it is still not clear how you are going to go about it. But in the end you do learn a lot from collaborating with students from other disciplines.'
Wageningen's international student population was reflected in the GreenWURks team: besides Dutch students, it included Chinese, Hungarian, Bulgarian, German and Italian students. Other teams were made up of participants from several different universities. The Flor-Green team had nine agricultural students from the Universities of Bologna and Florence, and the Green Spark team had 15 students from WUR and five other

European universities. The teams varied in size, too. Team GreenWURks had 18 members, while Team Thanks Work (University of Michigan) had only four members. This team won a prize too, for the best architecture.

COMMITMENT

'Taking part in the Challenge really took up an awful lot of time,' says Verweij. Zhang: 'It is evening and weekend work, and it is a real commitment. It's not just an odd job you can easily fit in on the side.' Lotje Hogerzeil (25), a Master's student of Urban Systems Engineering, kept a blog about her participation in the Challenge. 'I don't think I – or the whole Evergreen team – have ever worked so hard on a project.' On 25 July, after nearly seven months of beavering away, her team submitted their design at four o'clock in the morning. 'All the papers I wrote, the exams I took, even the designs I made previously for courses: none of them came close to the blood, sweat and tears we shed to get this done.'

In their degree programmes, students get study credit points in the ECTS system, with one credit equivalent to 28 hours of work. But the Challenge participants did not get credits for their participation. Strange, in Verweij's view, given how much time participants put into it. 'You could get something in return for that.' At the same time, she adds, perhaps the strength of the Challenge lies precisely in the fact that it is not a course. 'You don't get chased up by a teacher. You have to find the motivation in yourself and your team.' Professor of Education and Competency Studies Perry den Brok is adamant that the Challenge must not be made into a course. 'As soon as you formalize it, by allocating study credits to it for instance, the creative aspect and the intrinsic motivation are lost.' But the education programme could benefit from some parts of the Challenge, thinks Den Brok. 'If you build a mini-Challenge into a foundation course, for instance, it might make it nicer and stretch students more .'

THE REAL WORLD

GreenWURks member Yaoyun Zhang is a Master's student of Organic Agriculture. He wants to use the knowledge and skills he is acquiring in Wageningen back in China later on. 'While I am studying here, I am trying to learn as much as I can about urban farming projects in Europe. The Challenge gave me an opportunity to explore how I can apply what I study in the real world. You step outside the academic world for a while and look at how to go about it in practice.' In that respect, the Greenhouse Challenge opened a lot of doors, says Verweij. 'We got access to a lot of places and people within the world of urban farming. That gives you a nice picture of the possibilities and the developments within that sector.' The team's victory feels like a reward, says Verweij. 'We all worked unbelievably hard on Open Bajes. That makes the moment when the jury says, "You've won" really cool.'

There are five more Greenhouse Challenges on the agenda for the coming 10 years. The next one will take place in China in 2020. Zhang already has a tip for the participants. 'People in big Chinese cities have a lot of stress from working hard. They've lost their connection with nature. The urban greenhouse is needed in China to change that.' ■

www.wur.eu/studentchallenges

THE WINNING DESIGN: OPEN BAJES

The GreenWURks team won the Greenhouse Challenge with their Open Bajes design. In the design, large parts of the prison walls are replaced with glass and solar panels, creating an open feel while the history of the prison remains visible. One of the design's strong points, in the jury's view, is the 'Simpli-city' business model, based on community participation. Local residents can be shareholders in Open Bajes, which even has its own money: the BajesCoin. The building is designed to be an accessible place with space for activities such as workshops, exhibitions and sport. Residents and visitors can harvest fruit and vegetables themselves and get some experience of urban agriculture. The plant production system Biophilia is intended to be a closed cycle as far as possible. Moss from the greenhouse itself will be used as a nutrient base, and rainwater will be sprayed on the plant roots as mist, so that less water is needed than in conventional irrigation systems.

PHOTO GUY ACKERMANS

JOHAN BOUMA, EMERITUS PROFESSOR OF SOIL SCIENCE:

‘Our knowledge is not applied enough’

The various soil science institutes around the world operate too independently of each other, with too little focus on the application of the knowledge, says emeritus soil professor Johan Bouma. 'I think it's one of the big questions in soil science: why is our knowledge still not applied enough?'

TEXT RIK NIJLAND **PHOTOGRAPHY** MARCEL MOLLE

'One third of the soils on earth are eroded, salinized, compacted or have lost their organic matter to a dramatic degree. In most cases we actually know perfectly well what we should do about that. Ten years ago, for instance, at the initiative of Wageningen researchers, an overview was made with 150 case studies describing the successful approach to various forms of soil degradation. We should talk more with stakeholders about that and get people involved. I think it's one of the big questions in soil science: why is our knowledge still not applied enough ?'

Science for Impact, the motto of Wageningen University & Research, perfectly suits emeritus professor of Soil Inventorization and Land Evaluation Johan Bouma. 'Science is wonderful, but in my opinion the results should serve to solve problems,' he says. 'Applied research sometimes has the image of not being the real thing. And that is reflected in the way it is remunerated. In my view, there is no real difference between applied and fundamental research: you analyse a problem, you formulate a hypothesis and research it with good methods that lead to a reproducible result, independent of the financier. That applies universally. If the result is good, it will be used or applied. If that doesn't happen, you should ask yourself why not. Maybe because it had nothing at all to do with a real problem?'

Life hasn't got all that much less busy for Johan Bouma, who is 78 but doesn't let that stop him cycling in from Rhenen for the interview. This week he has already given a talk to Master's students and attended a discussion about scientific ethics at the Royal Netherlands Academy of Arts and Sciences (KNAW). And he still has an enviable H index of 74. This measure of scientific impact counts the number of published articles and how often researchers cite them. 'I now mainly work with universities in Naples, Sydney and Dresden,' he says. 'Once you've left your own university, you must avoid getting under people's feet there. My wife sometimes asks, "What does retirement mean, actually?"'

NO INTEREST IN COWS

He grew up on a dairy farm in the province of Friesland. 'I would have been the fifth generation of the Bouma family on the farm but I have absolutely no interest in cows. Luckily, my parents were relaxed about that. From a career choice test I got the advice to study politics and social sciences in Amsterdam. I think they got that right. Later I did go into the policy side of things, including being on the Scientific Council forGovernment Policy. But at that time I didn't think I would be at home in the big, hectic city.' So in 1959, Johan Bouma came to Wageningen.

'Why did I pick soil science? I don't have a particularly clear story about that, actually. There wasn't nearly as much choice in Wageningen then as there is now; cows were out of the question, I knew nothing about crop farming, so it ended up being soil science. No, I don't regret it. I still find it incredibly fascinating that soil, which is practically invisible, is so crucial in land use. Erik Smaling discovered in a recent research project that 80 per cent of the differences in harvests in Ethiopian agriculture are down to soil characteristics. Each soil has a story to tell, and it is our task as soil researchers to translate that story into human language.' And Bouma did this with so much passion and conviction that in the past few years >

'For mitigating climate change there's no getting around the soil'

he has been showered with honours (see inset), including major prizes for distinguished careers. But Bouma himself is not at all prone to harking back to the past. He would much rather talk about his mission for the future: 'We soil scientists must focus on the UN's Sustainable Development Goals,' he believes. 'About 190 governments have signed the agreement on them, committing themselves to results by 2030. Of course, those are nice words and nothing will come of it, but those sustainability goals do provide us with a sense of direction, a target on the horizon. And they are also generating renewed interest in our field. For an adequate food supply, clean water, biodiversity and to mitigate climate change, there's no getting around the soil.' And this is increasingly being recognized, Bouma notices. But if his discipline is to play a role in realizing the sustainability goals, something's got to change, he thinks. 'We must collaborate more, both with each other and with other disciplines. When I came to Wageningen, you had applied soil science at Duivendaal and the specialists in soil physics, soil chemistry and fertilization at De Dreijen. They were different worlds with a certain degree of rivalry. Those sub-disciplines still have their own chair-holding professors, which is unique in the world, but fortunately collaboration is now high on the agenda,' says Bouma. 'From an international perspective I think the different soil science disciplines still operate too independently of each other.' They all 'charge ahead', in his words, separately accumulating new knowledge, with too little focus on its potential application.

> **'Applied research sometimes has the image of not being the real thing'**

100 YEARS OF SOIL RESEARCH IN WAGENINGEN

1930s

SOIL MAPS

In the 1930s, **Willem Oosting** was the first person to make soil maps of the area around Wageningen, for farmers and other land users. His work was continued by **Kees Edelman**, who laid the foundations of the soil mapping of the Netherlands, working during the Second World War with students who had gone into hiding from the Nazis on soil maps for the Bommelerwaard area in the Rhine delta. This work continued in the decades following the war. In the 1950s, Edelman also pioneered the use of aerial photography for soil mapping. Nowadays, soil characteristics and therefore the value in use of the land are mapped from the air.

CAT POO

At the boundary between peaty and clay soils, and influenced by groundwater, extremely acid soils are formed in which not much grows. Dutch farmers call this soil cat poo, but that was too crude for soil scientists, who adopted the term cat clay. In the mid-1970s, **Nico van Breemen** succeeded in decoding the chemistry underlying this phenomenon. Applying Wageningen knowledge, cat claywas dealt with at various wet locations around the world, including the Mekong delta, where **Tini van Mensvoort** worked on it. This led to a big rise in agricultural production.

1980s

SOIL UNDER PRESSURE

In the early 1980s, **Frans de Haan** advised people on problems of toxicity, such as the Lekkerkerk housing estate scandal. He also successfully campaigned against the use of sewer sludge – full of heavy metals – as a fertilizer in agriculture. It became clear that even animal fertilizer has a big impact on the soil. From the 1970s, **Willem van Riemsdijk** developed models for phosphate saturation of soil, which are still a cornerstone ofthe phosphate policy in the Netherlands. In a publication in *Nature*, also in the 1970s, **Nico van Breeman** clarified how ammonia from manure acidifies the soil. A relevant theme again today.

He sees digital soil mapping as a good example. 'An awful lot has already been published about how it could be even better. But should we devote our scarce material and human resources to it? Let's take the example of the legally required data collection about nutrients in the livestock sector. Why don't we make efforts to ensure that all the farmers get this kind of modern soil map? In combination with models for simulating the water and nutrient dynamics, the farmer would then be able to respond to his crop's needs in good time.
He wouldn't have to wait until the plants go all limp, but would know in time that the nutrients are running out. Plus, he can avoid over-fertilizing and therefore polluting groundwater and surface water. This would be a significant soil science contribution to precision agriculture, *and* to circular agriculture. And what is more, we would be making an immediate, real contribution to the development goals.'
Is the reflex to go on doing more and more research necessary, Bouma wonders. 'Of course you need new specialized research because our current understanding sometimes falls short. The web of life is unbelievably complex. But let's do it more in consultation with other disciplines which study that closely interwoven system of soil, water, plants and climate. And before we start researching yet another new topic, let's first see what we can achieve using our current knowledge. To have an impact, we must listen to stakeholders as well, to avoid isolating ourselves and becoming ivory tower scientists.'

LOADS OF TIME

'Working in a more interdisciplinary way takes up loads of time, I do realize that, and time is in short supply in the research world. PhD students have to publish four articles in four years. In that situation it's hard to avoid keeping your work monodisciplinary. That can produce perfectly good science but it won't help you reach the UN's sustainability goals.
'The linear model – hypothesis, study, result – doesn't work for the SDGs. There are no simple, straightforward solutions to the world food supply question, for example. There are a lot of conflicting interests at stake, and possible courses of action eventually emerge from a compromise between those interests. Science can provide independent data to support that process.
'The time is past when scientists could dream up such compromises themselves at their computers. We must involve stakeholders more in our work, take them seriously, listen, and take them along in a shared quest. That is our challenge for the 21st century, in which, sadly, alternative facts that ignore the truth are gaining more and more influence.' ■

www.wur.eu/slm
www.wur.eu/healthy-soils

LIVING SOIL

In the 1980s, **Lijbert Brussaard** started experimenting with a new form of soil management in the North-east Polder in the northern Netherlands. Less manure, less ploughing and more organic matter stimulate soil life, which then contributes more to the nutrition of plants and the structure of the soil. Several farmers adopted this approach. In the new Agroecology and Technology Test Location in Lelystad, work continues on the supporting role of soil biology. In the Paris Agreement on climate, boosting the proportion of organic matter in the soil is listed as one of the key measure for slowing CO_2 emissions.

PRIZES

In 2018, Johan Bouma was honoured in a special way. The scientific journal *Geoderma* will soon publish a special edition in which 18 of his PhD graduates, now spread around the world, contribute articles in honour of their former mentor. The emeritus professor has had numerous honours bestowed on him in recent years. In 2014, he received the Soil Society of America's President's Award. Last year he received the Alexander von Humboldt medal from the European Geosciences Union, for his research in developing countries. And the icing on the cake was the prestigious Dokuchaev award, granted every four years by the International Union of Soil Sciences, which he received this year for his research and teaching in soil science.

Making salt water drinkable

Wageningen was already able to desalinate seawater to produce pure drinking water. Now researchers have taken the technology further to generate electricity too. They are currently looking for trial projects. The Middle East is interested.

TEXT RENÉ DIDDE **ILLUSTRATION** STEFFIE PADMOS

Wageningen researchers have been able to turn seawater into drinking water for some time by heating the water and sending the vapour through a membrane with tiny holes that the salts cannot permeate. This principle, which is called Memstill, was tested in a number of trial projects from 2012. A hotel on the island of Malta got its drinking water from the sea for six months using the process. Closer to home, rose growers used it to purify their irrigation water as a test. The water could be reused as the membrane kept back the salts and contaminants. The salts were sometimes reused as fertilizer.

'The membrane technology has also been successfully tried out for removing water from brine tanks used for salting cheese so that the water can be reused instead of discarded,' says researcher Norbert Kuipers of Wageningen Food & Biobased Research. There are numerous other applications. 'It can be used to turn orange juice into concentrate after it has been pressed, which can save a lot on space and energy in transport. Memstill is also suitable for condensing milk to create milk powder in an energy efficient way.'

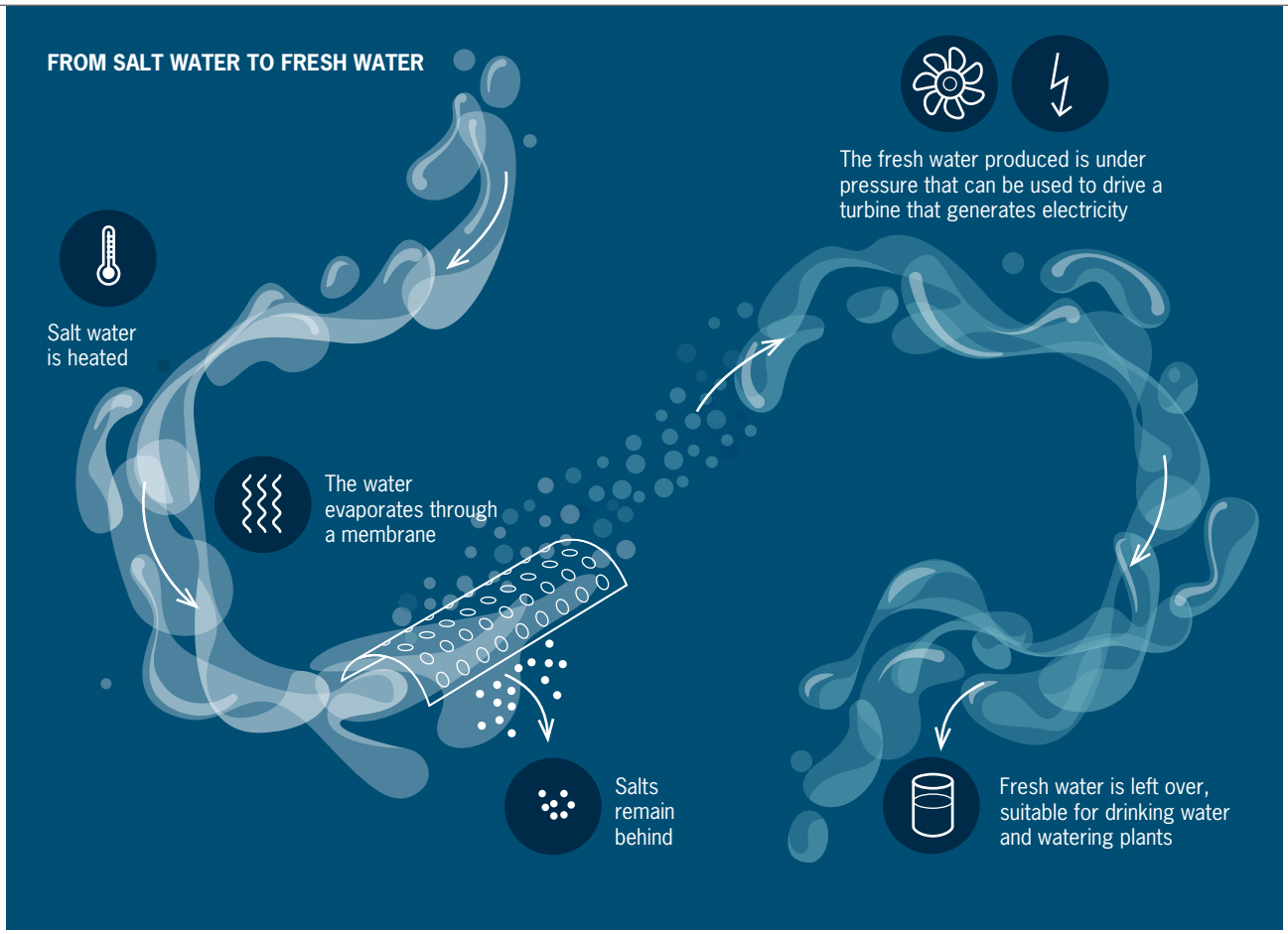
TNO came up with the technology. Norbert Kuipers was working for TNO then. At the start of this year, his department of 40 people moved to Wageningen and the membrane technology research ended up with Wageningen Food & Biobased Research.

'Memstill is not yet being applied commercially as the technique is still more expensive than conventional techniques, which use reverse osmosis,' explains Kuipers. That involves forcing water through membranes.

SUSTAINABLE WATER USAGE IN GREENHOUSES

This autumn, some 23 organizations from 10 different EU countries — including Wageningen University & Research — presented the Fertigation Bible, a reference work summarizing 125 ways of using use of water in greenhouses sustainably. 'Fertigation' is a portmanteau of fertilization and irrigation. 'Market gardeners are using increasingly sophisticated systems for applying their irrigation water with dissolved fertilizer components and additives to the soil or substrate,' explains Willy van Tongeren of Wageningen Food & Biobased Research. 'Now, for the first time, they have an exhaustive list of techniques, with descriptions of all the pros and cons that have been observed, that they can use to see if there are innovative, sustainable techniques suitable for their production system.' Both Memstill and Mempower are included in the guide.

Info: www.fertinnowa.com



'The standard technology is more developed but it does use more energy.' To shift the business case in favour of Wageningen's membrane technology, a new dimension is now being added in the laboratory to the approach. 'If you let the purified water flow through the system a little more slowly than the water entering the system, rather than draining it off immediately, the water pressure builds up. If we then pass that water through a turbine, we can generate electricity,' says Kuipers. Research shows that the electricity generated is enough to keep the process itself running, perhaps with some surplus power too.

GLOBAL WATER AWARD

Last year, this invention — known as Mempower — received the MBR Global Water Award in Dubai. MBR refers to His Highness Sheikh Mohammed bin Rashid Al Maktoum, prime minister of the United Arab Emirates and an advocate of sustainable water and energy initiatives. The attention this membrane technology has attracted in the Middle East is no coincidence, explains Kuipers. 'Not only are a lot of countries and islands there short of clean drinking water, they also have an abundance of solar heat. And that heat is the driving force behind the Mempower principle, which works by heating the water.'

'The membranes have to withstand the water pressure'

Large solar power stations and solar farms are being built in many countries in the region, often on the edge of the desert. 'We can use this source of energy cheaply in our process by taking heat from there, forexample by send the water in pipes along the solar cells. An additional advantage is that this would cool the solar cells; they produce more electricity if the temperature is slightly lower.'

Another appealing aspect is that the salts from the seawater can be recovered and used in table salt, bath salts or (for the potassium and magnesium salts) fertilizer. But Kuipers and his fellow researchers are not there yet. They can currently get 26 square metres of membrane in a tube measuring 50 centimetres in diameter and 1 metre in length by rolling it up cleverly. 'That could perhaps be improved. It's also clear that the membranes need to be able to withstand the increased water pressure in the system. We hope to be a lot further intwo years' time,' says Kuipers. Tests on a real-life scale should help bring about these improvements. Kuipers does not want to say which companies are interested but his travel schedule suggests there will be tests in the Middle East. ■

www.wur.eu/purifying

Together with Wageningen

In 2018, Wageningen University & Research celebrated its centenary with the help of a wide range of partners. Close collaboration typifies its approach. 'Wageningen graduates can have glorious careers with us'

You can find more information on the centenary and the partners who contributed at www.wur.nl/100years

OLIVER MAY,
Senior Science Fellow at DSM

'Doing ground-breaking research on sustainability'

'DSM is working on better food and nutrition for everybody. To do so successfully, we need capable partners like WUR. Wageningen is assisting us on our journey with its in-depth understanding of food science. We recently set up the Sustainable Food Initiative project together with WUR and other partners. In this project, we're doing ground-breaking research on making the food supply chain more sustainable. The aim of the research is to be able to continue to satisfy the demand for food that is sustainable, healthy and safe. The research is about reducing the footprint, circular-economy food production and reducing waste in the supply chain. We want to help consumers make healthy and sustainable food choices. In addition to this major initiative, there are various bilateral projects with Wageningen, for example to find natural solutions for combating food waste at various points in the supply chain.'

GERARD ROBIJN,
Director of Innovation Excellence at FrieslandCampina

'Coming to Wageningen was a good move'

'FrieslandCampina decided five years ago to move all the Research & Development departments to Wageningen campus. That was a very good move. Now it's easy for us to drop in on staff at Wageningen University & Research. We can also make use of their facilities. And vice versa: we can help them, for example by hosting a practical for food technology students in our pilot plant. What is more, we can now easily introduce interns to our company. That is a very good way of recruiting talented students for a job with our company.
Among other things, FrieslandCampina and WUR are doing joint research on the immunological properties of raw milk. We are also working together on studying the digestibility of proteins, the effects of prebiotic fibres on intestinal health and the significance of proteins for maintaining muscles and muscle strength.'

GERRIT SMIT,
Managing Director at Yili Innovation Center Europe (YICE)

'The campus infrastructure works really well for us because of the short lines of communication with Wageningen University & Research and other research groups and companies based there. We explain what our needs are and WUR proactively comes up with ideas. YICE focuses on the Chinese market. We also give Chinese students the opportunity to do an internship at our company.

We are working with WUR on the research areas of health, food safety and dairy technology. In dairy technology, we are comparing the composition of breast milk in China and the Netherlands. We will be able to use the results to adjust our baby food to suit our most important market — China.'

RUUD TIJSSENS,
Director of Public & Cooperative Affairs at the Royal Agrifirm Group

'Wageningen University & Research doesn't just help you, it also has its own vision and agenda. To give an example, Wageningen has clearly influenced thinking about closed-cycle agriculture. Manure processing is an important topic in that regard. Organic manure has gone from being a nuisance surplus material to a valuable source of nutrients for the soil and plants. Breakthroughs in technology and organization are essential, though. We are working intensively on this in partnership with other companies and WUR.'

JOEP LAMBALK,
Director of Research & Development at Enza Zaden

'We have an excellent relationship with the research groups'

'R&D is incredibly important in our company. Enza Zaden invests heavily in this on a permanent basis. Our aim is to continue giving people around the world access to healthy vegetables. Collaboration is the key to success in this. That is why we have a great relationship with Wageningen University & Research; their senior managers will soon be paying another visit to our company. We also have an excellent relationship with various research groups, for example groups studying aspects of developmental biology. Wageningen students are more than welcome to do an internship at our company. Graduates are welcome too. They can look forward to a glorious career with us. We are growing fast: this year alone, we have had 200 vacancies around the world.'

KENNETH HEIJNS,
Managing Director of the Amsterdam Institute for Advanced Metropolitan Solutions (AMS Institute)

'Wageningen's expertise can also be applied in an urban context'

'Amsterdam is growing fast and that entails all kinds of urban challenges in areas such as raw materials, energy, food, the climate, mobility and data. As a joint venture involving three scientific institutions (of which WUR is one), AMS Institute is bringing the technological know-how to the city for research, teaching and innovation. The knowledge of Wageningen University & Research can be applied in an urban context too and have an impact on issues such as how to deal with the effects of climate change, how to set up a sustainable, regional food system for a growing city and how to close the cycle of raw materials in a city.'

‘We plant a tree for every night booked’

Personally, he ‘can’t stand’ holiday bungalows in parks. ‘Right from the moment you arrive. You have to go through barriers, there is always a restaurant and the stereotypical swimming pool with slides. It’s all so standardized and the guests are all herded together.’ No, Tim van Oerle (31) and his brother Luuk (29) are more the do-it-yourself types. The Van Oerles would rather reach their weekend house over a bumpy track, preferable in the middle of

TIM VAN OERLE, CO-FOUNDER OF NATURE.HOUSE:

‘I wanted to be an entrepreneur; that’s a profession in itself’

Tim van Oerle was still a student when he and his brother started Nature.house, the booking platform for getaways in nature. Now they have 18 employees and took well over 120,000 bookings this year. ‘Seems we’re not the only ones who hate holiday parks.’

TEXT RENÉ DIDDE **PHOTOGRAPHY** BRAM BELLONI

nowhere, where no one will bother them if they light a fire, go birdwatching (Tim) and photograph birds (Luuk).
With this ideal in mind, the brothers launched their now successful business and booking platform Nature.house (starting with a Dutch website, Natuurhuisje.nl) back in 2009. ‘I was studying in Wageningen and my brother and I wanted to go birdwatching in the Extremadura region of western Spain. I searched and searched for a quiet house where we could do our own thing undisturbed, but all I could find was bungalows in those kinds of holiday parks.’
This is weird, thought the brothers. So they got the idea of starting something that would meet their own need for nature. But they both thought it would be sensible to finish their degrees first. Tim was studying Economics, Environment & Policy at Wageningen, and Luuk was doing Finance at Tilburg University.
Their fascination with nature and birds goes back a lot further than the Extremadura trip, though. Their father had spent a gift of money on a tract of forest near the home where the brothers grew up in Prinsenbeek, near Breda. ‘We went into our own woods every weekend with a bird book.’
When they were still students, the brothers spent time in between exams creating a simple website for holiday lets. Later on, they involved fellow students as >

programmers. Tim had enthusiastic discussions with his housemates in De Heerlijkheid student house, Hoogstraat 26. 'I was sharing the house with Pepijn Meddens, now chief technology officer for companies such as Wonderkind (a platform for matching candidates with jobs) and Billink (an electronic system for payment after receipt of goods). And I also talked a lot about entrepreneurship with Thijs Verheul, the founder of United Wardrobe, a kind of eBay for second-hand clothes.'

BECOMING AN ENTREPRENEUR

His degree course in Wageningen confirmed Van Oerle's idea that the environment and economics don't have to clash. He learned that nature can have real economic value, not least because people can relax more and are less illness-prone and therefore less likely to be off work if they are out in nature frequently. 'But I'm not the type to spend four years working this out down to the last detail in statistical models. I wanted to become an entrepreneur, and that is a profession in its own right. You can't learn it anywhere, and that includes Wageningen.'
After graduating in 2013, Tim van Oerle and his brother got down to serious business – true to form, in an attic. Not on the Hoogstraat in Wageningen, though, but in their parental home with its patch of forest near Breda. 'Originally, our concept, Natuurhuisje.nl, involved offering people renting out accommodation an annual subscription,' he explains. 'That meant people could rent out a house in a natural setting through our site. They got the rent and we got an annual fee.'
In the early days of their business they received support from the Startlife bureau in Wageningen. Startlife aims to promote entrepreneurship and help people turn innovative ideas into sustainable businesses. 'We also got an interest-free startup loan of 10,000 euros from Startlife. And there was absolutely no hurry to pay it back. Startlife also forced us to put our ideas into a business plan,' says Van Oerle. He has good memories of the drinks and meals he had with other Startlife participants. After a year, the brothers changed their business model, partly as a result of critical discussions Tim had in that period with the then KLV director Paul Besten, who was involved in Startlife. 'We switched from an annual subscription to a "no cure no pay" system. Just like a website like Booking.com, we get a fee from the property owner for every booking made on Nature.house.com. Ten per cent of the rent (excluding VAT) of the holiday home comes to us.'
It is no longer just a case of holiday houses and bungalows, though. If you look on www.Nature.house, you'll also see a variety of glamping options, yurts and gypsy caravans, all 'in the most beautiful nature and often in undiscovered spots,' as the website says.

TIM VAN OERLE (1987)

Wageningen University & Research, BSc in Forest and Nature Management, MSc in Economics, Environment and Policy - 2008–2013

Co-founder with his brother Luuk of Nature.house - 2009

CHAT

'To give people the nice feeling of having a complete getaway from the hustle and bustle of their daily lives,' is how Tim van Oerle sees his mission. And, he adds, 'above all, I want them to see how lovely nature can be. We want to bring people closer to nature.'
The brothers aim to create a community around Nature.house as well. 'Through a chat system, for instance, to improve communication between owners and guests. Also through the reviews that guests can write, like on Airbnb, including criticisms or points for improvement.
Owners can respond to reviews and can also answer guests' questions in advance, so they know what the facilities will be like.'
Nature.house has really taken off. In 2017 the platform handled 20 million euros' worth of transactions. By October this year, the Van Oerles had seen the 120,000th booking. They now have 18 people working for them. 'It seems we're not the only ones who can't stand holiday parks,' jokes Tim. 'I really believe nature is far more popular among a broad section of the population than politicians realize. Nor can the success entirely be put down to the fact that people want to get away more often, and closer to home, now that they have more money to spare,' he adds. 'When we started, the economic crisis was still going on, and even then we grew rapidly, against the market trends.' The majority of guests are busy over-45s, but there are a growing number of young people too. 'At first we mainly attracted birdwatchers and people looking for peace and quiet, but we now we get renters across the board who need a break from the stress of their hectic lives.'

> ‘Nature is far more popular than politicians realize’

Van Oerle is alert to the need to preserve the principles of the concept, and to make improvements where possible. The criteria the brothers use for ‘nature houses’ are simple. ‘They can’t be in a large holiday park, and the park mustn’t have a swimming pool and a reception, or more than 20 houses. Because we want it to be far from the hurly-burly, the accommodation can’t be in a town or village, or near motorways or the railway,’ he says. Houses that do not meet the criteria are turned down.

Meanwhile, the brothers have launched their English-language website and spread their wings across Europe. More than a quarter of their 8000 houses are in the Netherlands. There are 1000 in Belgium and 2000 in France — in both countries most of the owners are Dutch or Belgian. But the brothers are beginning to get a foothold in Germany and Scandinavia too.

Nature.house is now honing its sustainability principles. ‘We plant a tree for every night booked. So this year we will have planted 120,000 trees in the damaged mangrove swamps of Madagascar. We have been there to see how the foresters are going about it. And we may support afforestation projects in Spain and Portugal as well.’ ■

100 YEARS OF THE LEB FOUNDATION

‘Sometimes young researchers just need that little extra’

Over the past century, the LEB Foundation has donated almost two million euros to research on topics ranging from breeding methods to dwelling mounds in Friesland. Nowadays, the foundation opts to support PhD students, young researchers and foreign visiting staff. ‘It can make all the difference to young people.’

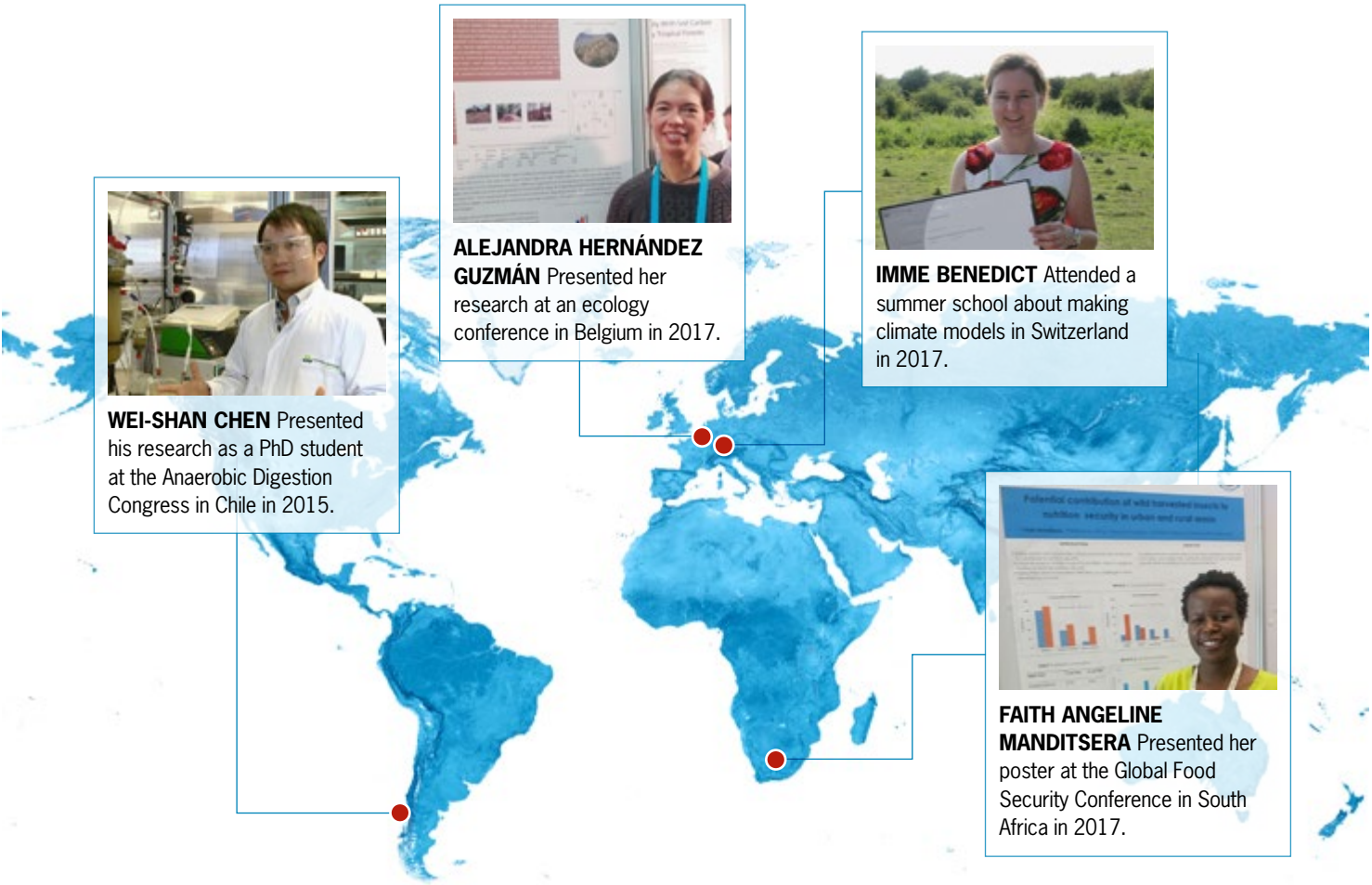
TEXT MARION DE BOO

‘In September last year, I was very keen to attend a summer school in Switzerland about how to make a high-resolution climate model,’ says meteorologist Imme Benedict. ‘An expensive course for a scientist at the start of her career, but it was precisely in my field and would be attended by a lot of the leading researchers whose articles I had read.’ Happily, the LEB Foundation covered half of Imme’s costs. ‘I came back fired up with enthusiasm,’ says the Wageningen PhD student. ‘For a whole week you talk to interesting people and you hear about the latest developments. Now that I have a better idea about the state of the art in this field, I can place my own PhD research in a broader perspective. And it was also great to meet so many enthusiastic young people in my field from countries from Canada to China, and to talk about all the issues you run up against as a young researcher.’
The LEB Foundation, which celebrates its centenary this year, gives young researchers timely support. The foundation honours about 60 applications per year from PhD students and young researchers, as well as from foreign visiting staff at Wageningen University & Research. Applications for things like a summer school, a field trip for a group of PhD students, or the chance to take up an invitation to give a poster presentation or talk at an overseas conference.

SAFEGUARDING EXPORTS

The LEB Foundation grew out of the Dutch agricultural export bureau association (LEB), which was established in 1916. That was in the middle of World War One, in which the Netherlands, a trading nation, remained neutral. The LEB’s task was to safeguard the import and export of agricultural products and promote Dutch business interests. When the association was closed down in 1918, there was still 280,000 guilders in the kitty – the equivalent of nearly 1.85 million euros today. Over the past century, the returns on that capital have been used for study tours as well as to cover research and scientific expenses – for studies on anything from the link between groundwater tables and yields, or the shelf life of horticultural products, to the vitamin A supply for chicks, or breeding methods for increasing milk production in Frisian cows. In the early years, as much as 50,000 guilders was also spent on archaeological research on plant and animal remains in the terps, or artificial dwelling mounds, of Friesland and Groningen provinces. And

‘For a whole week you talk to interesting people’



WEI-SHAN CHEN Presented his research as a PhD student at the Anaerobic Digestion Congress in Chile in 2015.

ALEJANDRA HERNÁNDEZ GUZMÁN Presented her research at an ecology conference in Belgium in 2017.

IMME BENEDICT Attended a summer school about making climate models in Switzerland in 2017.

FAITH ANGELINE MANDITSERA Presented her poster at the Global Food Security Conference in South Africa in 2017.

A few of the many young researchers who have attended symposiums, conferences and summer schools all around the world.

in the 1940s, an illustrated, four-volume reference work on Japanese butterflies was published. In the course of a century, the LEB Foundation spent a total of nearly 2 million euros. Nowadays, the LEB Foundation no longer covers research and academic expenses.

FIVE PROFESSORS

Because the foundation's statutes lay down that its board must be made up of five Wageningen professors, the LEB Foundation keeps in touch with developments thatare important for PhD students and chair groups.

The LEB Foundation is independent of Wageningen University & Research, but WUR provides it with administrative services. In practice, this is delegated to the University Fund Wageningen. Funding is granted strictly on a co-financing basis, contributing up to 50 per cent of the actual costs up to a fixed maximum. The applicant needs to secure the other 50 per cent from other budgets. 'Sometimes young people need just that little extra to be able to achieve something in their research,' says Wim Heijman, professor of Regional Economics and treasurer and secretary of the LEB Foundation. 'So for years our foundation has opted to enable a relatively large number of PhD students and young researchers to benefit from small grants, rather than allocating large grants to a select few. For young people at the start of their academic careers, that can make a big difference in developing their talents.'

TESTIMONIALS

In honour of the foundation's centenary, the board has had a web page created with a world map that shows where the trips that have been supported in recent years went to. Heijman: 'There are testimonials on it from the PhD students too. That gives a really good overview of the huge diversity in destinations and research projects.'

One example is the talented Taiwanese environmental technologist and Wageningen PhD student Wei-Shan Chen, who presented his research results at the Anaerobic Digestion Congress in Vinã del Mar, Chili, in 2015. 'A fantastic opportunity,' he says, 'because this is the biggest conference in our field.' His PhD research was about microbial water purification techniques for converting urban waste into useful chemicals for agriculture and industry. 'It was the first time I had presented my research results. We had adapted existing methods, and nobody believed in that, but our results showed that it really does work. That was groundbreaking.' Wei-Shan Chen also did some useful networking at the conference, including meeting a Colombian professor with a Wageningen PhD himself, with whom he has since been collaborating. ■

www.universityfundwageningen.eu/lebfund

Round the world twice

Together, they cycled round the Earth more than twice. All over the world, Wageningen alumni, staff and students got on their bikes to mark the centenary of the university, and then shared their stories online at WUR on Wheels.

Willem van der Pas (Climate studies 2015) really ate up the kilometres: he cycled 2540 kilometres during the WUR on Wheels month. The kilometres were part of his journey by bike from Utrecht to Thailand. 'I would say I found the gradual changes in landscape and climate zones the most interesting aspect of this world trip. I started in a cold European winter, 15 below zero in Luxembourg, whereas the thermometer hit 45 degrees in Turkmenistan.' He often started conversations with local people he met on his route, as he writes in his blog. 'I asked them about the weather. It's interesting to see that even people in tiny villages in the countryside often tell you the weather is different to what it used to be.'

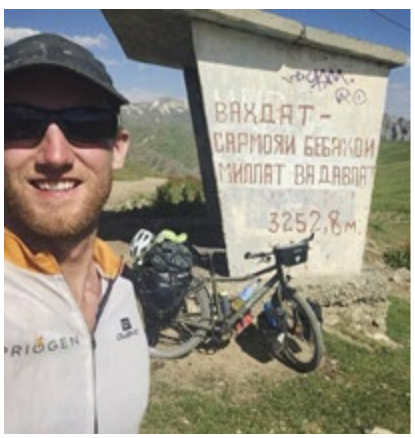
In the WUR on Wheels 'campaign month' from 15 September to 15 October, 270 participants cycled 97,000 kilometres, raising 10,811 euros for the Wageningen Borlaug Youth Institute. This institute encourages schoolchildren to think about global climate issues and environmental problems.

One of the goals of WUR on Wheels was to put WUR people and their work in the spotlight. The fundraising aspect was added later. The bicycle was the medium. 'Students cycle. International students often learn to cycle here. And alumni all over the world continue to cycle,' says Caroline Berkhof of 100 Years of WUR. That is clear from the world map of WUR on Wheels: Antarctica was the only continent not to have any participants.

DIRT ROADS

Laurie van Reemst (Plant Sciences 2015) provided a dot on the map for Uganda, where she is working for Wageningen Environmental Research. Although she is not cycling as much as she would like. 'Cycling in Kampala, the capital of Uganda, is very different to the Netherlands. It's not to be recommended as a mode of transport as it is far too risky with the other vehicles, and the air quality is poor. I sometimes go mountain biking in the local area, along the lovely red dirt roads and through farmers' fields, but you have to watch out for goats roaming freely and loose stones if you want to avoid accidents.'

Info: wuronwheels.wur.nl and 100years@wur.nl



FIGURES

50,000th alumnus

Eline Suijten (21) completed her Bachelor's in Biology in July, making her WUR's 50,000th alumnus since 1918. To mark the milestone, rector magnificus Arthur Mol congratulated her and gave her a WUR jumper. 'I planned that well,' was Suijten's response.
The alumnus counter is now already quite a way past the 50,000 mark. The number of degrees per academic year is growing in step with the university. In the 2004-2005 academic year, 1297 degrees were awarded; that number had more than doubled in 2016-2017 to 2946.
Info: denise.spiekerman@wur.nl

PHOTO GUY ACKERMANS

FUNDS

Support for African animal nutrition students

The first student with a grant from the Future Animal Nutrition Africa Fund (FANA), Nisola Ayanfe from Nigeria, started her studies in September 2018. The fund is intended for candidates from Africa who want to do the Master's degree in Animal Sciences at Wageningen, specializing in Animal Nutrition and Metabolism or Global and Sustainable Production.
FANA was set up by alumnus Nico de Vos (Zootechnics 1982) and his wife Bertha. 'It's because we wanted to encourage students from Africa to come to Wageningen to study animal nutrition,' explains De Vos. Until last year, he was the director of the compound feed company ForFarmers; he now advises the ForFarmers board and is on the board of a foundation promoting the study of animal nutrition. 'My wife and I have always been interested in Africa. We hope we will soon be able to support animal nutrition projects there via the alumni returning to Africa.'
Info: arianne.vanballegooij@wur.nl

GATHERING

Crossing Spain to meet up

On Monday 1 October, 25 alumni gathered at the Dutch embassy in Madrid for a reception to celebrate WUR's centenary. The initiative came from Aída Herranz (Urban Environmental Management 2006), who works for the Spanish Railway Foundation. 'She sent the embassy an email asking whether it would be possible to arrange an alumni gathering in Madrid,' says alumni relations officer Denise Spiekerman.
The gathering was organized by Wageningen University & Research and the embassy's agriculture team. Ambassador Matthijs van Bonzel welcomed the alumni, Denise Spiekerman gave a presentation about 100 years of WUR and two alumni talked about their time at Wageningen. Some alumni had made long journeys to meet up with their former fellow students. There were alumni from Malaga, Almeria and Zaragoza, says Spiekerman. The people who attended were so enthusiastic that the possibility of setting up an alumni network in Spain is now being investigated.
Info: alumni@wur.nl

WUR CONNECT

Internship

Michiel Voermans, a student at Wageningen, is looking for an internship in Edinburgh (Scotland) for his Master's in geo-information science and remote sensing. Any contacts or recommendations are welcome. See *wurconnect.nl/userprofile/index/36923* for his profile.

Expanding

WUR Connect acquired 125 new members last month, taking the total to 8100. You can invite alumni yourself via Facebook or email. Announcements of 44 new vacancies were also posted. Furthermore, over 2600 alumni offer career coaching to other alumni via WUR Connect.

Event

5 February 2019: WUR Career Day. Companies, WUR staff, students and PhD candidates can meet one another at this networking event with a trade fair, workshops and presentations. Last year, more than 60 organizations took part, including companies, research institutions, government bodies and associations. *More information: www.wur.nl/en/wageningen-university/career-day.htm*

Reactions

Has WUR Connect helped you find an internship, a job or a friend you lost touch with? Let us know via *alumni@wur.nl*

See wurconnect.nl for more events and vacancies

Prof. Yuling Bai, WUR Biotechnology 2000, has been appointed professor holding a personal chair at the Laboratory of Plant Breeding. 1 July 2018.

Prof. Johan Bouma, WUR Soil and Fertilization Sciences 1966, former professor of Soil Science, received the Dokuchaev Award from the International Union of Soil Sciences in Rio de Janeiro. 16 August 2018.

Prof. Adriaan Geuze, WUR Landscape Architecture 1987, professor by special appointment in Landscape Architecture and co-founder of the firm West 8, received the triennial Klinkenbergh prize for his role in the development of the Dutch landscape. 4 October 2018.

Alexander Haverkamp PhD, WUR Plant Sciences 2011, researcher at the Laboratory of Entomology, has received a Veni grant from the Dutch Organization for Scientific Research (NWO) for his research on caterpillars. 16 July 2018.

Karen Kloth PhD, WUR Biology 2004, researcher at the Laboratory of Entomology, has received a Veni grant from the NWO for her research on environmentally friendly crop protection from aphids and viruses.16 July 2018.

Bernard Koeckhoven MSc, WUR Agrarian Economics 1983, departing senior manager at Achmea, has been made a Knight of the Order of Orange-Nassau. 12 September 2018.

First Wageningen Marina van Damme grant

Julia Samson PhD, WUR Biology 2012, is the first Wageningen alumnus to receive the Marina van Damme grant. Samson was granted 9000 euros as a contribution to her next career move. She has now started as a postdoc at the Max Planck Institute in Konstanz (Germany). She is concentrating there on the collective behaviour and neurobiology of corals. She is using the grant for training in microscope techniques, a course in neurobiology and accommodation costs in Konstanz. Samson is pleased she will now be able to do important courses thanks to the grant. 'But getting the grant also makes me feel I'm not the only person who finds my research interesting.'
The aim of the Marina van Damme Fund is to broaden and deepen the careers of female scientists. The fund was set up for graduates from technical universities; Wageningen was added in 2017.

PHOTO GUY ACKERMANS

Julia Samson and Marina van Damme

Judith van de Mortel PhD, WUR PhD 2007, has started as lector in 'Healthy plants in a vital and sustainable soil' at HAS University of Applied Sciences in Venlo. 9 July 2018.

Dennis Oonincx PhD, WUR Animal Sciences 2008, postdoc in Animal Nutrition, has received a Veni grant from the NWO for his research on the use of vitamin D by insects. 16 July 2018.

PHOTO GUY ACKERMANS

Fré Pepping PhD,
WUR Human Nutrition 1981, was made an Officer of the Order of Orange-Nassau on his departure as secretary of the VLAG graduate school for improving the professionalism of the PhD training in Wageningen and of Wageningen training courses in Africa. 5 October 2018.

David van Raalten MSc, WUR Land-Use Planning Sciences 1995, has been appointed a board member of the Drents Overijsselse Delta water board. 1 November 2018.

Maryna Strokal PhD, WUR Environmental Sciences 2011, researcher in the Water Systems and Global Change group, has received a Veni grant from the NWO for her research on solutions for river pollution. 16 July 2018.

Daan Swarts PhD, WUR Molecular Life Sciences 2011, has received a Veni grant from the NWO for his research on the characterization of bacterial immune systems that could be used in genetic modification. 16 July 2018.

PHOTO TESSA LOUWERENS

Prof. Katrien Termeer, WUR Land Development 1987, professor Public Administration and Policy, has been appointed by the Crown as a member of the Social and Economic Council. Prof. Termeer will focus on governance, sustainability and international corporate social responsibility. 11 September 2018.

Wim Thielen MSc, WUR Zootechnics 1984, has been made a member of the Order of Orange-Nassau. 26 April 2018.

Prof. Louise Vet, Leiden University Biology 1978, WUR professor of Evolutionary Ecology and director of the Netherlands Institute of Ecology, tops the new Sustainable 100 list of the newspaper Trouw. 10 October 2018.

Yvonne Wientjes MSc, WUR Animal Sciences 2011, has received a Veni grant from the NWO for her research in the field of genomic animal breeding. 16 July 2018.

Ruud Wilbers MSc, WUR Biology 2008, researcher at the Laboratory of Nematology, received a Veni grant from the NWO for his research on the sugars coating worm vaccines. 16 July 2018.

Hannah van Zanten MSc, WUR Animal Sciences 2009, assistant professor in the Animal Production Systems group, received a Veni grant from the NWO for her research on the role of animals in a circular-economy food system. 16 July 2018.

Book on agile working

Addo de Visser MSc, WUR Farming Technology 1988, has written a book about agile working and organizing, an approach in which one or more teams deliver products in cycles of a month or less. De Visser works as a coach helping teams to apply the agile approach. In his book, he shows how organizations can switch to this way of working and how they can make sure the switch is profitable.
Entitled *Agile – The times they are a-changin'*, the book is published by Vior webmedia (21.95 euros, in Dutch only). The proceeds will go to a leadership programme for children in developing countries.

A different approach to the planet

Albert Faber MSc, WUR Environmental Technology 1998, senior policy adviser at the ministry of Economic Affairs and Climate Policy, has written the book *De gemaakte planeet – Leven in het Antropoceen* (The engineered planet — Living in the Anthropocene). In the Anthropocene, humans have more influence than ever on the planet. Faber discusses what the Anthropocene is and how we should deal with the planet in future.
He wrote the book because 'we need an alternative account of how we should treat the Earth. It's currently often all about technology and management ("we can do this") or a moral question ("you must stop flying"). Neither really work. The book is about responsibility and hope. It's a positive story. I think there is a lot of need for that.'
It is published by Amsterdam University Press (22.50 euros, in Dutch only).

IN MEMORIAM

Alumni, KLV members, staff and former employees of Wageningen University & Research who have recently passed away.

Mr G.J.P.M. de Bekker PhD, WUR Human Nutrition 1974. 21 July 2018.
Prof. J.G. van Bekkum, former director of research, CDI. 26June 2018.
Ms H.R. Bloksma BSc, employee at WUR Virology. 11 September 2018.
Mr A. Boks PhD, WUR Rural Sociology of the Western Regions 1964. 21 August 2018.
Mr F. Bruinsel MSc, WUR Forestry 1962. 5 August 2018.
Mr H.L. Dorussen MSc, WUR Forestry 1975. 22 August 2018.
Mr M.F.H. Eskens BSc, WUR student Soil, Water, Atmosphere. 28 June 2018.
Mr R.C. Esser MSc, WUR Environmental Protection (Water Purification) 1984. 29 September 2018.
Mr H. Huberts, former WUR employee. 22 April 2018.
Mr C.F. Jaarsma PhD, WUR Land Development 1970. 26 July 2018.
Mr P.A. Janssen MSc, WUR Zootechnics 1950. 26 December 2017.
Mr A.A. van der Koppel MSc, WUR Horticulture 1961. 25 July 2018.
Mr K.F. de Korte MSc, WUR Water Purification 1973. 27 September 2018.
Prof. H.A. Luning, WUR Tropical Rural Economics 1959. 6 October 2018.
Mr P. Meijers MSc, WUR Dairy Production 1954. 26 July 2018.
Ms K. Mulder MSc, former WUR student counsellor. 23 August 2018.
Mr A.J. Munting, former WUR assistant professor. 8 September 2018.
Mr C.L. Rijpma MSc, WUR Agricultural Plant Breeding 1953. 24 August 2018.
Mr M.E.W. Roelofs MSc, WUR Farming Technology 1989. 18 July 2018.
Mr J.M. Veldhuis, WUR Land Development 1952. 29 December 2017.
Mr A.E.M. van Vilsteren MSc, WUR Tropical Land Development 1978. 5 October 2018.

IN MEMORIAM (CONTD)

Ms A.H.C. Vlasveld MSc, WUR Human Nutrition 1987. 20 September 2018.
Mr T.M.G. Voermans MSc, WUR Biology 1984. 8 May 2018.
Mr N.M. de Vos MSc, WUR Tropical Plant Breeding 1953. 13 February 2018.
Mr J.F. Wienk PhD, WU Tropical Plant Breeding 1960. 23 July 2018.
Mr G.W. Wieringa PhD, WUR Agricultural Plant Breeding 1950. 11 August 2018.
Ms J.C.M. Witteman PhD, WUR Human Nutrition 1985. 23 August 2018.
Mr F.N. Zwart MSc, WUR Forestry 1967. 6 April 2018.
Ms J.A. Zwart PhD, former member of the WUR academic staff. 1 November 2018.

If you would like to inform us of the death of a fellow former student or relative, you can email alumni@wur.nl or send a death announcement to the Alumni Department, University Fund Wageningen, Droevendaalsesteeg 4, 6708 PB Wageningen, Netherlands.

M-BASE award for founders of Kromkommer and Kipster

Chantal Engelen MSc, WUR Economics and Consumer Studies 2009, and Ruud Zanders MSc, WUR Economics of Agriculture and the Environment 1998, both received a Mansholt Business Award for Sustainable Entrepreneurship (M-BASE) on 19 September 2018. The prize is awarded every three years to successful entrepreneurs who demonstrate enthusiasm and sustainability in running a company.

They each received half of the associated prize money of 25,000 euros. Chantal Engelen founded Kromkommer, a company that focuses on unattractive vegetables that end up processed as waste rather than on supermarket shelves. Engelen wants to inform consumers about the food wastage and persuade supermarkets to sell the veg anyway. Kromkommer also turns unattractive vegetables into soup, which it then sells to caterers and restaurants. At the award ceremony, Engelen said she hoped that Kromkommer would no longer exist in five years' time 'as we would then have achieved our aim and these vegetables would be on sale in supermarkets.'
Ruud Zanders is the cofounder of Kipster. This poultry farm puts closed-cycle agriculture into practice. The feed for the chickens comes from waste products from the food industry and the farm runs on solar energy. The female chicks become laying hens. The male chicks are raised for meat rather than being destroyed. Last year, Kipster signed a contract with Lidl for the sale of Kipster eggs and meat.

KLV

KLV | WAGENINGEN ALUMNI NETWORK

KLV is for all 'Wageningers', to promote contact with other KLV members, alumni, students and the university. You can network in your own subject area through the study circles and sub-networks.
KLV also offers career support, such as a CV check or relevant workshops. And members often get discounts on lectures and debates. Come and get to know us at one of our activities! There is a selection below, and a full overview can be found at www.klv.nl

KLV General Assembly

The Annual General Assembly of KLV will be held on 12 December 2018. The meeting will be conducted in Dutch. All KLV members are welcome. www.klv.nl

More people! More food?

On 12 December 2018, the study circle for development issues (SKOV) invites members, students and alumni to join the seminar entitled 'Population Dynamics: More people! More food? Sub-Saharan Africa is about to burst its banks.' www.klv.nl/events

Innovation in food and agriculture

On 15 May 2019 the F&A Next conference will connect food and agriculture startups with investors, serving as a springboard to greater innovation and a better deal for all. www.fanext.com

KLV Wageningen Alumni Network is the active and flourishing alumni association of Wageningen University & Research, with more than 8500 members. Would you like to join? www.klv.nl.
On the opposite page, one of our members on his passion.

More information
www.klv.nl

KLV

Camiel Aalberts

KLV member since 1996

A PASSION FOR choral singing

'Singing is a very physical activity,' says consultant and trainer Camiel Aalberts, who graduated in Food Technology in 1994. 'You have to do it with your body. And to be able to sing well, the body needs to be relaxed and healthy. That's why we always do relaxation exercises at the start of a rehearsal.' Baritone Camiel has choir practice every Wednesday with Venus Chamber Choir in Utrecht. 'It's very hard work at times: to get the right sound and intonation you need to relax your midriff and be aware of your physical posture, of the neck and head for instance.' His choir sings mainly contemporary classical music, sometimes pieces that have never been performed before. 'The eagerness and curiosity with which we and our conductor bring a piece like that to life make it all the more enjoyable.'

In this feature, KLV members talk about what makes them tick.

WANT TO BECOME A MEMBER?

Visit our website www.klv.nl

PHOTO GUY ACKERMANS

PHOTO ALAMY

Helping small livestock farmers in South Africa improve production

About half the cattle, sheep and goats in South Africa belong to small livestock farmers, says Judith Jacobs of Wageningen Centre for Development Innovation. Jacobs has developed and delivered training courses for farmer organizations in South Africa that seek to help small livestock farmers improve their meat production and reduce the grazing pressure on the land. 'That requires a tailor-made approach,' says Jacobs, 'which means not just churning out a standard lesson but addressing regional problems.'

Jacobs' client was Conservation South Africa (CSA), an NGO whose aim is for nature conservation and development to go hand in hand. The training courses are funded by Nuffic, the Dutch organization for internationalization in education.

CSA wants to reinforce the farmer organizations so they can contribute to the quality of their members' livestock through measures such as joint purchasing, veterinary care, rotation grazing and organizing markets.

'Our training courses focused on teaching farmer organizations in three different regions to organize themselves better, tackle problems they had in common, and solve conflicts,' says Jacobs. 'The circumstances vary from region to region. In Namakwa District the main issue is independence from middlemen. In Mzimvubu Catchment, reliable weighing scales are a hot topic. We dealt with those differences in our training courses so the participants could draw up action plans that were applicable in their regions.'

Info: judith.jacobs@wur.nl